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Index

VERBAL REASONING

NON-VERBAL REASONING

ANALYTICAL REASONING

General Competition Guides At A Glance



Disha's General Knowledge At A Glance



Chapter 1

Analogy & Classification

ANALOGY

The meaning of analogy is 'similar properties' or similarity. If an object or word or digit or activity shows any similarity with another object or word or digit or activity in terms of properties, type, shape, size, trait etc., then the particular similarity will be called analogy. The relationship of analogy can be established in two ways :

(i) A : B :: C : D

(ii) A : B :: C : D

Types of Analogy
- Word Analogy
- Letter Analogy
- Number Analogy
- Mixed Analogy

WORD ANALOGY

In word analogy, candidates have to find the relationship between given words in a pair.

Remember

1. **Tool & Object Based Analogy**

   This establishes a relationship between a tool and the object in which it works.

   EXAMPLE

   Scissors : Cloth

2. **Synonym Based Analogy**

   In such type of analogy two words have similar meaning.

   EXAMPLE

   Huge : Gigantic

3. **Worker & Tool Based Analogy**

   This establishes a relationship between a particular tool and the person of that particular profession who uses that tool.

   EXAMPLE

   Writer : Pen

4. **Worker & Product Based Analogy**

   This type of analogy gives a relationship between a person of particular profession and his/her creations.

   EXAMPLE

   Writer : Book

5. **Causes & Effect Based Analogy**

   In such type of analogy 1st word acts and the 2nd word is the effect of that action.

   EXAMPLE

   Work : Tiredness

6. Opposite Relationship (Antonym) Based Analogy

In such type of analogy the two words of the question pair are opposite in meaning.

EXAMPLE

Poor : Rich

7. Gender Based Analogy

In such type of analogy, one word is masculine and another word is feminine of it or It is a 'male and female' or 'sex' relationship.

EXAMPLE

Man : Woman

8. Classification Based Analogy

This type of analogy is based on biological, physical, chemical or any other classification. In such problems the 1st word may be classified by the 2nd word and vice-versa.

EXAMPLE

Oxygen : Gas

9. Function Based Analogy

In such type of analogy, 2nd word describes the function of the 1st word.

EXAMPLE

Singer : Sings

10. Quantity and Unit Based Analogy

In such type of analogy 2nd word is the unit of the first word and vice-versa.

EXAMPLE

Distance : Mile

11. Finished Product & Raw Material Based Analogy

In such type of analogy the 1st word is the raw material and 2nd word is the end product of that raw material and vice-versa.

EXAMPLE

Yarn : Fabric

12. Utility Based Analogy

In such type of analogy the 2nd word shows the purpose of the 1st word or vice-versa.

EXAMPLE

Pen : Writing

13. Symbolic Relationship Based Analogy

In such type of analogy, the 1st word is the symbol of the 2nd word and vice-versa.

EXAMPLE

White : Peace

14. Adult & Young One Based Analogy

In such type of analogy, the 1st word is the adult one and 2nd word is the young one of the 1st word or vice-versa.

EXAMPLE

Cow : Calf

15. Subject & Specialist Based Analogy

In such type of analogy the 2nd word is the specialist of 1st word (subject) or vice-versa.

EXAMPLE

Heart : Cardiologist

16. Habit Based Analogy

In this type of analogy 2nd word is the habit of 1st and vice-versa.

EXAMPLE

Cat : Omnivorous

17. Instrument and Measurement Based Analogy

We see in this type of analogy, the 1st word is the instrument to measure the 2nd word and vice-versa:

EXAMPLE

Hygrometer : Humidity

18. Individual & Group Based Analogy

Second word is the group of 1st word (or vice-versa) in such type of analogy.

EXAMPLE

Cow : Herd

19. State & Capital Based Analogy

1st word is the state and 2nd word is the capital of that state (1st word) (or vice-versa) in the analogy like this.

EXAMPLE

Bihar : Patna

20. Analogy Based on Individual & Dwelling Place

In such type of analogy 1st word is the individual & 2nd word is the dwelling place of that individual (1st word) and vice-versa.

EXAMPLE

Horse : Stable

21. Analogy Based on Worker and Working Place

In this type of analogy the 1st word represents a person of particular profession and 2nd word represents the working place of that person (1st word) and vice-versa.

EXAMPLE

Doctor : Hospital

22. Analogy Based on Topic Study

1st word is the study of the 2nd word (or vice-versa) in the analogy like this.

EXAMPLE

Birds : Ornithology

LETTER ANALOGY

In this, candidate has to find out the relationship between given letters or group of letters.

Analogy Based on Letters (or Meaningless Words)

Case I : Forward alphabetical sequence

EXAMPLE

CD : FG : : PQ : UV

Here, CD and FG are in the natural alphabetical sequence. Similarly, PQ & UV are in the natural alphabetical sequence.

Case II: Backward or Opposite alphabetical sequence

EXAMPLE

DC : GF : : QP : VU

In fact this case is opposite of case I

Case III: Vowel – Consonant relation

EXAMPLE

ATL : EVX : : IPR : ORS

Here, the 1st two words start with the 1st two vowels A & E and the next two words start with the next two vowels I & O. Last two letter of every word are consonants.

Case IV: Skip letter relation

EXAMPLE

ABC : FGH : : IJK : NOP

Here, between ABC & FGH two letters skip and they are D & E. Similarly, between IJK & NOP two letters skip and they are L & M.

Case V: Jumbled letters relation

EXAMPLE

(i) LAIN : NAIL : : EVOL : LOVE

Here, the 1st term gets revereased to produce the 2nd term and similar relation is shown in between 3rd and 4th term.

❑ *Shortcut Approach*

I: While solving the problems based on alphabet, you must have in your mind the exact positions of every letters of alphabet in forward order as well as in backward or reverse order as given below:

Letters positions in forward alphabetical order:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
13	14	15	16	17	18	19	20	21	22	23	24	25	26

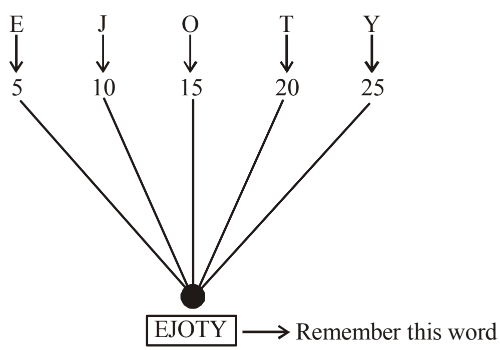
Letters positions in backward or reverse alphabetical order:

Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

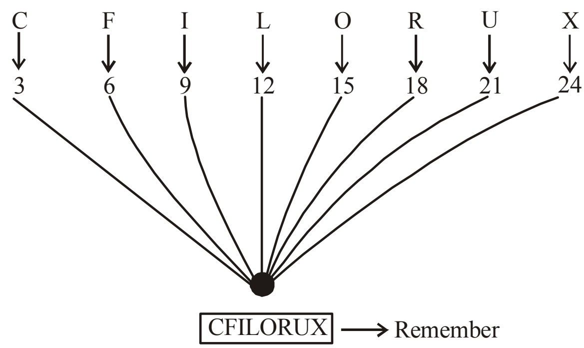
	K	J	I	H	G	F	E	D	C	B	A
5	16	17	18	19	20	21	22	23	24	25	26

II: Just keep in mind, the following positions of the letters in the English alphabet (forward order).

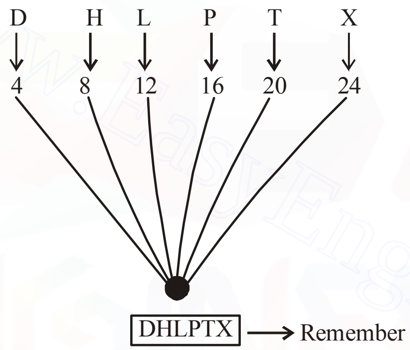
(i)



(ii)



(iii)



NUMBER ANALOGY

In this, candidate has to find out the relationship the number or group of numbers.

Remember

- Even and Odd numbers

  EXAMPLE 84 : 51 : : 72 : 37

  (Here, 84 & 72 are even and 51 & 37 are odd numbers respectively)
- Addition and subtraction of numbers.

  EXAMPLE 234 : 9 : : 136 : 10

  (Here, 2 + 3 + 4 = 9 and 1 + 3 + 6 = 10)
- Multiplication and Division of numbers

  EXAMPLE 3 : 21 : : 5 : 35

  (Here, $3 \times 7 = 21$ and $5 \times 7 = 35$)
- Squares & Cubes of numbers

  EXAMPLE 4 : 16 : : 8 : 64

  (here, $4^2 = 16$ and $8^2 = 64$)

MIXED ANALOGY

In this, candidate has to find out the relationship between the given group of letters and a number on one side.

EXAMPLE AB : 12 : : CD : : 34

(Here, A B ↓ ↓ 1 2 (positional value) and C D ↓ ↓ 3 4 (positional vlaue)

CLASSIFICATION

In classification we take out an element out of some given elements and the element to be taken out is different from the rest of the elements in terms of common properties, shapes, sizes, types, nature, colours, traits etc. In this way, the rest of the elements form a group and the element that has been taken out is not the member of that group as this single element does not possesses the common quality to be possessed by rest of the elements.

Types of Classification

(1) Letter/meaningless word based classification
(2) Meaningful word based classification
(3) Digit based classification
(4) General knowledge based classification

1. Letter/Meaningless Word Based Classification

Such classifications are based on letters of English alphabet. So many groups of letters are given in the question in which one group is different from remaining groups and hence the different group will be our answer.

EXAMPLE

(a) PQT **(b) UVY**
(c) DEH **(d) IJN**
(e) FGJ

Sol. (a) Here, P Q (R S) T → 2 letter gap

(b) U V (W X) Y → 2 letter gap

(c) D E (F G) H → 2 letter gap

(d) I J (K L M) N → 3 letter gap

(e) F G (H I) J → 2 letter gap

2. Meaningful Words Based Classification

In such type of classification we have to take odd word out of the given group of meaningful words.

EXAMPLE

(a) Slim **(b) Trims**
(c) Greets **(d) Grid**
(e) Fight

Sol. (a) Here, Sl(i)m → 1 vowel (b) Tr(i)ms → 1 vowel

(c) Gr(ee)ts → 2 vowels (d) Gr(i)d → 1 vowel

(e) F(i)ght → 1 vowel

3. Digit Based Classification

In such type of classifications digits or numbers are given to find out one number that is not a part of the group of remaining numbers.

EXAMPLE

(a) 122 **(b) 128**
(c) 199 **(d) 200**
(e) 388

Sol. 199 is an odd number while all the other options are even numbers.

4. General Knowledge Based Classification

Such classification is done on the basis of our general knowledge. No doubts that this is a word based classification but without having general knowledge this type of questions can not be solved.

EXAMPLE

(a) Cat **(b)** Dog
(c) Tiger **(d)** Octopus
(e) Lion

Sol. Octopus is the only animal out of given options which is a water animal. Rest of the options are land animals.

❑ Shortcut Approach

Step I : See all the given options with a serious eye.

Step II : Try to make relation of similarity among the given options.

Step III : Find out the one word not having the common similarity like other four options and that one word will be your answer.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-1-7
Chapter Test	–	C-1-2
Past Solved Papers		

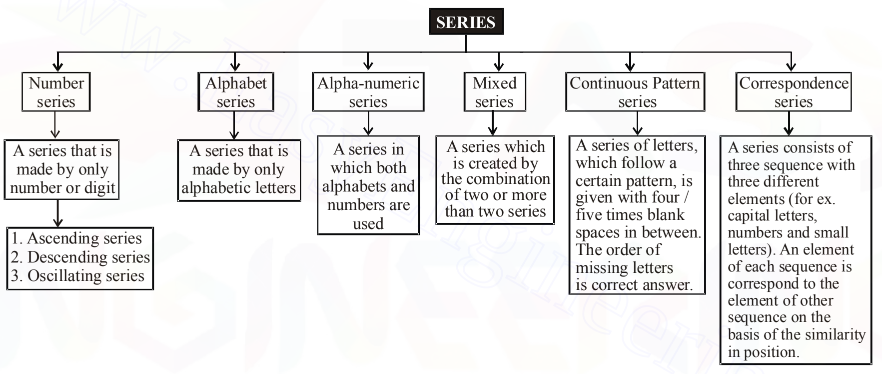
Chapter 2

Series

INTRODUCTION

A series is a sequence of numbers/alphabetical letters or both which follow a particular rule. Each element of series is called 'term'. We have to analyse the pattern and find the missing term or next term to continue the pattern.

Types of series are explained in the following chart:



NUMBER SERIES

Number series is a form of numbers in a certain sequence, where some numbers are mistakenly put into the series of numbers and some number is missing in that series, we need to observe first and then find the accurate number to that series of numbers.

Remember

- Even and odd numbers.
- Prime and composite numbers.
- Square and square roots of a numbers.
- Cube and cube roots of a numbers.
- Arithmetic Operations
  - → Addition
  - → Subtraction
  - → Division
  - → Multiplication

Types of Number Series

1. Perfect Square Series

This type of serics are based on square of a number which is in same order and one square number is missing in that given series.

EXAMPLE **841, ?, 2401, 3481, 4761**

Sol. $29^2, 39^2, 45^2, 59^2, 69^2$

2. **Perfect Cube series**

Perfect Cube series is a arrangement of numbers is a certain order, where some number which is in same order and one cube is missing in that given series.

EXAMPLE **4096, 4913, 5832, ?, 8000**

Sol. $16^3, 17^3, 18^3, 19^3, 20^3$

3. **Mixed number series**

Mixed number series is a arrangement of numbers in a certain order. This type of series are more than are different order which arranged in alternatively in single series or created according to any non conventional rule.

EXAMPLE **6, ?, 33, 69, 141, 285**

Sol. $\times 2 + 3, \times 2 + 3, \times 2 + 3, \times 2 + 3, \times 2 + 3, \times 2 + 3$

4. **Geometric Series**

Geometric Number series is a arrangement of numbers in a certain order, where some numbers are this type of series are based on ascending or descending order of numbers and each continues number is obtain by multiplication or division of the previous number with a static number.

In geometric series number is a combination of number arranged.

EXAMPLE **21, 84, 336, ?, 5376**

Sol. $21 \times 4 = 84$

$84 \times 4 = 336$

$336 \times 4 = 1344$

$1344 \times 4 = 5376$

5. **Prime series**

When numbers are a series of prime numbers.

EXAMPLE **2, 3, 5, 7, 11, 13, __ , 19**

Sol. Here, the terms of the series are the prime numbers in order. The prime number, after 13 is 17. So, the answer to this question is 17.

6. **Alternate Primes**

It can be explained by below example.

EXAMPLE **2, 11, 17, 13, __, 41**

Sol. Here, the series is framed by taking the alternative prime numbers. After 23, the prime numbers are 29 and 31. So, the answer is 31.

7. **The difference of any term from its succeding term is constant (either increasing series or decreasing series):**

EXAMPLE **4, 7, 10, 13, 16, 19, __, 25**

Sol. Here, the differnce of any term from its succeding term is 3.

$7 - 4 = 3$

$10 - 7 = 3$

So, the answer is $19 + 3 = 22$

8. **The difference between two consecutive terms will be either increasing or decreasing by a constant number:**

EXAMPLE **2, 10, 26, 50, 82, __**

Sol. Here, the difference between two consecutive terms are

$10 - 2 = 8$

$26 - 10 = 16$

$50 - 26 = 24$

$82 - 50 = 32$

Here, the difference is increased by 8 (or you can say the multiples of 8). So the next difference will be 40 (32 + 8). So, the answer is 82 + 40 = 122

9. The difference between two numbers can be multiplied by a constant number:

EXAMPLE **15, 16, 19, 28, 55, __**

Sol. Here, the differences between two numbers are

16 – 15 = 1

19 – 16 = 3

28 – 19 = 9

55 – 28 = 27

Here, the difference is multiplied by 3. So, the next difference will be 81. So, the answer is 55 + 81 = 136

10. The difference can be multiples by number which will be increasing by a constant number:

EXAMPLE **2, 3, 5, 11, 35, __**

Sol. The difference between two number are

3 – 2 = 1

5 – 3 = 2

11 – 5 = 6

35 – 11 = 24

11. Every third number can be the sum of the preceding two numbers :

EXAMPLE **3, 5, 8, 13, 21, __**

Sol. Here, starting from third number

3 + 5 = 8

5 + 8 = 13

8 + 13 = 21

So, the answer is 13 + 21 = 34

12. Every third number can be the product of the preceeding two numbers :

EXAMPLE **1, 2, 2, 4, 8, 32. __**

Sol. Here, starting from the third number

1 × 2 = 2

2 × 2 = 4

2 × 4 = 8

4 × 8 = 32

So, the answer is 8 × 32 = 256

13. Every succeeding term is got by multiplying the previous term by a constant number or numbers which follow a special pattern.

EXAMPLE **5, 15, 45, 135, __**

Sol. Here,

5 × 3 = 15

15 × 3 = 45

45 × 3 = 135

So, the answer is 135 × 3 = 405

14. In certain series the terms are formed by various rule (miscellaneous rules). By keen observation you have to find out the rule and the appropriate answer.

EXAMPLE **4, 11, 31, 90, __**

Sol. Terms are,

4 × 3 – 1 = 11

11 × 3 – 2 = 31

31 × 3 – 3 = 90

So, the answer will be 90 × 3 – 4 = 266

❑ Shortcut Approach

- First check the direct formulas.
- If all the numbers are even, odd or prime.
- If all the number are perfect squares or cubes.
- If all the numbers have a particular divisibility.
- If all the numbers are succeeding by some additions or subtraction or multiplications or divisions by a particular number or addition of their cubes and squares.

Remember

- When the difference between the consecutive numbers is same/ constant or the number series is in **arithmetic progression.**

  a, a + d, a + 2d, ..., a + (n – 1) d.

  Where 'a' is first term, d is the common difference.

- When any number series is in the form a, a + (a + 1), a + (a + 1) + (a + 2), ... , n^{th} term of the series be $\left[\frac{n(n+1)}{2}\right]$

❑ Shortcut Approach

(i) If numbers are in ascending order in the number series.

- Numbers may be **added or multiplied** by certain numbers from the first number.

(A) 19 23 26 30 33 ?

19 23 26 30 33 37

×4 ×3 ×4 ×3 ×4

(B) 1 3 12 60 ?

1 3 12 60 360

×3 ×4 ×5 ×6

(ii) If numbers are in descending order in the number series,

- Numbers may be **subtracted or divided** by certain numbers from the first number.

(A) 34 18 10 6 4 ?

34 18 10 6 4 3

–16 –8 –4 –2 –1

(B) 720 120 24 6 2 1 ?

720 120 24 6 2 1 1

/6 /5 /4 /3 /2

(iii) If numbers are in mixing order (increasing and decreasing) in the number series.

- Numbers may be in **addition, subtraction, multiplication** and **division** in the alternate numbers.

200 165 148 117 104 ?

200 165 148 117 104 77

(14) 2+4 (13) 2–4 (12) 2+4 (11) 2–4 (10) 2+4 (9) 2–4

Step 1: Check whether it is ascending, descending or mixed order.

Step 2: It is in mixing order. So it may be in addition, subtraction, division and multiplication, squares and cubes.

Step 3: In above series it is mixing of square, addition and subtraction.

(14)2 = 196 + 4 = 200

(13)2 = 169. By adding 4 it gives 173.

Try subtraction.

169 – 4 = 165

Here we found it is in order of squaring a number, adding by 4 and subtracting by 4.

Hence, the answer for above series is 77.

200 165 148 117 104 ?

−35 −17 −31 −13 □

+18 −14 −18 −14

∴ □ = − 13 − 14 = − 27

? = 104 − 27 = 77

(B)

14 17 31 48 ? 127

14 17 31 48 79 127

14+17=31 → 17+31=48 → 31+48=79 → 48+79=127

ALPHABET SERIES

A series that is made by only alphabetic letters.

EXAMPLE **G, H, J, M, ?**

Sol. G H J M [Q]

+1 +2 +3 +4

❑ Shortcut Approach

- Remember all the alphabets and their place number.
- Intervals like :

E	J	O	T	Y	,	C	F	I	L	O	R	U	X
↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓	↓	↓
5	10	15	20	25		3	6	9	12	15	18	21	24

ALPHA NUMERIC SERIES

These kind of problems used both mathematical operation and position of letters in the alphabet in forward, backward order.

EXAMPLE **K 1, M 3, P 5, T 7, ?**

Sol. Alphabets follow the sequence

K M P T Y

+2 +3 +4 +5

And numbers are increasing by 2.

MIXED SERIES

EXAMPLE **Z, L, X, J, V, H, T, F, __, __**

Sol. The given sequence consists of two series

(i) Z, X, V, T, __

(ii) L, J, H, F, __. Both consisting of alternate letters in the reverse order.

∴ Next term of (i) series = R, and

Next term of (ii) series = D

CONTINUOUS PATTERN SERIES

It is a series of small/capital letters that follow a certain pattern like repetition of letters.

EXAMPLE **b a a b – a b a – b b a – –**

Sol. b a a b b a / b a a b b a / b a

❑ Shortcut Approach

- Firstly, count the number of blanks and given letters.
- Divide the whole sum of blanks and letters by a multiple.
- Note down the pattern common to all groups separately.

ebooks Reference		*Page No.*
Practice Exercise with Hints & Solutions	–	P-8-14
Chapter Test	–	C-3-4
Solved Papers		

Chapter 3

Alphabet & Number Test

INTRODUCTION

As we know that English alphabet is a group of English letters, hence the problems based on alphabet are the problems based on English letters.

Types of Problems

(1) General series of alphabet
(2) Random series of alphabet
(3) Problems of word formation
(4) Problems of letter gap
(5) Finding Digits after rearrangement.

1. GENERAL SERIES OF ALPHABET

EXAMPLE 1. Which of the following options is seventh to the right of the 13th letter from the left in a forward Alphabet series?

Sol. 1st of all we will write the forward alphabet series as given below:

A B C D E F G H I J K L M

13th letter from left

N O P Q R S T U V W X Y Z

7th letter

From the above series it is clear that M is the 13th letter from left and to the right of M (13th letter from left), T is the 7th letter.

Here, we have solved this problem with a general method. But this type of problem can also be approached through quicker method that will help you save some extra consumed time.

Shortcut Approach

(a) If both the directions are same then subtraction of numbers takes place.
(b) If the directions are opposite then addition of numbers takes place.

SHORTCUT METHOD FOR ABOVE EXAMPLE:

Now, for solving the example we apply this rule. As we want to find out the 7th letter to the right of the 13th letter from the left, the directions are opposite and thus shortcut (b) will be applied here. Hence, we add 7 + 13 = 20. Therefore, the answer will be 20th from left. Also, 20th from left less mean 26 – 20 + 1 = 7th from right. We can easily see,

$\therefore$ 20th letter from left = T

Also 7th letter from right = T

After solving the example, you must have noticed that the above mentioned trick is to calculate the actual position of the required letter before going to search for it.

Remember

mth element to be counted from left to right of a series of x characters is equal to $(x + 1 - m)$th element to be counted from right to left of that series. This rule can be better illustrated by an example which is given below:
Let us take the forward order alphabet series,

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

As we know that English alphabet has 26 characters, hence, we have $x = 26$.
Now suppose, we have to find out the position of K in the above given series counting from right to left.
Position of 'K' in the English alphabet from left to right is 11. Thus $m = 11$
$\therefore$ Position of K in the above given series from right to left would be $(26 + 1 - 11) = 16$

How to solve problems when letters are dropped or deleted at regular intervals?

EXAMPLE 2. If every 3rd letter from left to right of English alphabet is deleted, then what would be the 6th letter from left in the new series obtained?

Sol. General method:

A B Ⓒ D Ⓔ F G H Ⓘ J K Ⓛ M N Ⓞ
P Q Ⓡ S T Ⓤ V W Ⓧ Y Z

Here, deleted letters have been encircled and we find the new series as given below:

A	B	D	E	G	H	J	K	M	N	P	Q	S	T	V	W	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

It is clear, that 6th letter from left in the new series is H.

❑ *Shortcut Approach*

No doubt, above general method gives the correct answer. But we need to save extra consumed time and this is the reason we go for a quicker approach.

As per the example, every third letter is deleted in the original series. It does mean that we are left of two letters after every deletion. Here, '2' is the key digit for us and we have to find out 6th letter from the left in the new obtained series. Therefore, we have to find a digit which is just less than 6 but divisible by 2. For this question the digit just less than 6 and divisible by 2 is 4. Now, we follow the operation given below:

6th letter from the left in the new series = $6 + \frac{4}{2}$

= 8th letter from the left in the original series, which is it.

In the same manners, we can find out any letter at a particular position in the new obtained series.

$\therefore$ 16th letter from the left in the new obtained series = $16 + \frac{14}{2}$

= 23rd letter from the left in the original series which is W.

18th letter from the left in the new obtained series

$= 18 + \frac{16}{2}$

= 26th letter from the left in the original series which is Z.

The sample example can be asked in following way also.

"If every third letter from left to right in English alphabet is dropped (or deleted), then find out the 13th letter from right in the new obtained series".

To solve this, we find first of all the number of letters in the new obtained series.

As every third letter is dropped, hence we have

$\left(26 - \frac{26}{3}\right) = 26 - 8 = 18$ letters in the new series.

Point to be noted here that we divide 26 by 2 as every 3rd letter is dropped and after division we take approximate value of $\frac{26}{3}$ in round figure (approximate value of $\frac{26}{3}$ will be 8).

As per the example we have to find out 13th letter from right in the newly obtained series. This loss mean (18 + 1 – 13) = 6th letter from left which is H.

Note that : This shortcut approach can also be applied to the dropping of every 4th, 5th, 6th, 7th..... and so on letters from left to right at regular intervals.

How to solve problems based on the backward (reversed) alphabet series?

While solving problems based on general series of alphabet, we come across the various cases. In some cases we see that whole alphabet series is reversed but in some other cases 1st half of the series is reversed, or second half of the series is reversed or many segments of the alphabet series are reversed.

Let us take a case when a forward order alphabet series get reversed in three segments. In 1st segment 8 letters get reversed; in 2nd segment the next 8 letters get reversed and in the 3rd segment the remaining 10 letters get reversed. Just see the presentation given below:

A B C D E F G H | I J K L M N O P | Q R S T U V W X Y Z

Get reversed | Get reversed | Get reversed

H G F E D C B A | P O N M L K J I | Z Y X W V U T S R Q

(8 letters) | (8 letters) | (10 letters)

Now if you are asked to find out the 4th letter from left in the new obtained series, then through general method, we simply do counting from left in the new series and find out our required answer as 'E' because 'E' is at 4th position from left in the new obtained series. But while solving such type of problems, we have to do some time consuming formalities like (a) writing the original series (b) writing and reversing the letters of original series as per the question says and (c) counting them to get the required answer. Such time consuming processes can be avoided if we go through "**Remember**" and solve the question with shortcut approach.

❑ *Shortcut Approach*

It is clear that 4th letter from left in the new obtained series falls into first segment which has 8 letters. Hence, 4th letter in the new obtained series = (8 + 1 – 4) = 5th letter from the left in the original series. As we know that exact position of 5th letter from left in the original alphabet series is the position of E. Hence, E is our required answer.

If we have to find out 18th letter from left in the new obtained series, then that will be 16 + (10 + 1 – 2) = 25th letter from left in the original alphabet series (why?) which is Y.

In fact, while finding out 18th letter, we can easily see that 18th letter is the 2nd letter of 3rd segment and hence it will be not affected by 1st two segments having 8 letters each. In other words to find out 18th letter in the new obtained series, we have to find out the 2nd letter in the 3rd segment. This is the reason we find out the 2nd letter in the 3rd segment and then add the 16 letters of 1st two segment to get the 18th letter in the new obtained series. From this, we find that 18th letter from left in the new obtained series is the 25th letter from left in the original series. As 25th letter from left in the original series is Y. So, (Y) will be our required answer.

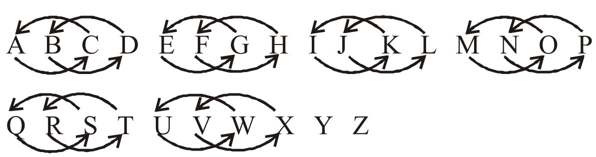
Readers are advised to practice such type of problems as you much as possible and after a certain time will notice that you have got a skill to solve such problems in a few seconds and that too, without the use of pen and paper.

How to solve if positions of letters are interchanged?

There is no any rule for such type of problems. Only the hard practice can given you a skill to solve such questions in a quick time.

EXAMPLE 3. If A and C interchange their places, B and D interchange their places, F and H interchange their places and so on, then which letter will be 5th to the left of Q?

Sol. As per the question the interchanges take place as follows:



Here we can see that Q interchanges with S. Then to left of Q, the 5th letter would be P because P interchanges with N.

How to find the Middle Letter?

❑ Shortcut Approach

Case I : Remember that if mth and nth letter from the left in the English alphabet are given then

Middle letter = $\left(\frac{m+n}{2}\right)$ th letter from the left.

EXAMPLE 4. Which letter will be midway between 8th letter from the left and 16th letter from the left in the English alphabet?

Sol. Here, $m = 8$ and $n = 16$

then middle letter = $\frac{8+16}{2} = \frac{24}{2}$

= 12th letter from left in the alphabet = L

❑ Shortcut Approach

Case II: Remember that if mth and nth letter from the right in the English alphabet are given then

Middle letter

$= \left(\frac{m+n}{2}\right)$ th letter from right

$= \left[26+1-\left(\frac{m+n}{2}\right)\right] = \left[27-\left(\frac{m+n}{2}\right)\right]$ th letter from the left in the English alphabet.

EXAMPLE 5. Which letter will be midway between 8th letter from the right and 16th letter from the right in the English alphabet.

Sol. Middle letter $= \left[27-\left(\frac{8+16}{2}\right)\right]$ th letter from left in the alphabet.

or middle letter = (27 – 12) = 15th letter from left = 0

Note : *In case I and case II (m + n) must be divisible by 2.*

❑ Shortcut Approach

Case III : Remember that if the mth letter from the left and the nth letter from the right are given then middle letter

$= \left[\frac{(m-n)+27}{2}\right]$ th letter from the left in the alphabet.

EXAMPLE 6. Which letter will be midway between 8th letter from the left and 15th letter from the right?

Sol. Here, $m = 8$ and $n = 15$

Then middle letter $= \left[\frac{(8-15)+27}{2}\right]$

$= \left[\frac{20}{2}\right] = 10^{th}$

letter from left in the English alphabet = J.

Note : *In case III (m – n) + 27 must be divisible by 2.*

2. RANDOM SERIES OF ALPHABET

This series is not in the proper sequence and letters take their position in the series in jumbled manner. Further, there is also a possibility that all the 26 letters of English alphabet are not available in the series. Even same letters may be repeated in the series.

EXAMPLE 7. How many letters in the following series are immediately preceded by B but not immediately followed by D?

R S P Q B A H M A C F B A D N O P B A C D.

Sol. R S P Q B (A) H M (A) C F B (A) D N O P B (A) C D

(first A: ✓; second A: ×; third A: ×; fourth A: ✓)

∴ Only the two times A fulfill the given condition and those A have been marked with the correct sign (✓). Those not fulfilling the condition have been marked with the cross sign (×). ∴ Required answer is 2.

3. PROBLEMS ON WORD FORMATION

In such problems, a word is given and you have to find out the number of words to be formed out of some letters drawn from that particular word.

EXAMPLE 8. How many meaningful words can be formed from the 3rd, 4th, 6th and 8th letter of the word 'CONTROVERSIAL'?

Sol.

C O (N) (T) R (O) V (E) R S I A L

N → 3rd, T → 4th, O → 6th, E → 8th

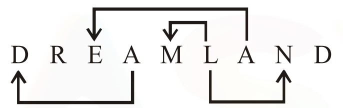
Now, from letters N, T, O and E, two words 'NOTE' and 'TONE' can be formed.

4. PROBLEMS OF LETTER GAP

Case II:

EXAMPLE 9. How many pairs of letters are there in the word 'DREAMLAND' which have as many letters between them as in the English alphabet?

Sol. Here, we are asked to solve problem according to English alphabet. In this case we have to count both ways. It does mean that we have to count from left to right and from right to left. Let us see the following presentation:



The above presentation makes it clear that the required pairs of letters are 4. (Pairs: DA, EA, ML and LN)

Case II:

EXAMPLE 10. How many pairs of letters are there in the word 'DREAMLAND' which have the same number of letters between them as in the English alphabet in the same sequence.

Sol. Here, we are asked to solve problems according to the alphabetical sequence. It does mean that we have to do counting only from left to right. Let us, see the following presentation:



The above presentation makes it clear that the required pair of letters is only 1 (Pair: LN)

5. FINDING DIGITS AFTER REARRANGEMENT

In this type of problems, a specified order or pattern is used to rearrange the positions of digits of the number. Then, either the number of those digits is found out whose positions remain unchanged after rearrangement or the digit at particular place from left or right of the number is to be found out.

EXAMPLE : (Direction (Qs. 11-15)

Following questions are based on the five three-digit numbers given below:

713 361 458 932 724

11. If the positions of the first and the third digits are interchanged in each of these numbers, then which of these will be an even number.

Sol. According to the question,

Original Numbers : 7 1 3 3 6 1 4 5 8 9 3 2 7 2 4

New Arrangement : 3 1 7 1 6 3 8 5 4 2 3 9 4 2 7

So, here only one number is even i.e., 854.

12. What is the difference between the sum of the three digits of the highest and that of the second highest number?

Sol. Highest number = 932

Second highest number = 724

So, the required difference

$= (9 + 3 + 2) - (7 + 2 + 4)$

$= 14 - 13 = 1$

13. If all the three digits are arranged in ascending order (from left to right) within the number, in each of these numbers, then which of these will be second lowest ?

Sol. According to the question,

Original number : 7 1 3 3 6 1 4 5 8 9 3 2 7 2 4

New arrangement : 1 3 7 1 3 6 4 5 8 2 3 9 2 4 7

So, the second lowest number will be 137.

14. If the positions of the second and the third digits are interchanged in each of these numbers, then which of these will be exactly divisibly by 2 ?

Sol. According to the question,

Original Numbers : 7 1 3 3 6 1 4 5 8 9 3 2 7 2 4

New Arrangement : 7 3 1 3 1 6 4 8 5 9 2 3 7 4 2

So, two numbers will be exactly divisible by 2, i.e., 316 and 742.

15. If the following numbers are arranged in descending order, then what will be the square of the digits sum of the third number from the right end of the new arrangement ?

Sol. According to the question,

Original Numbers : 7 1 3 3 6 1 4 5 8 9 3 2 7 2 4

New Arrangement : 9 3 2 7 2 4 7 1 3 4 5 8 3 6 1

3rd from the right end

Now, digits sum of the 3rd number from the right

$= 7 + 1 + 3 = 11$

$\therefore$ Square of the digits sum $= (11)^2 = 121$.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-15-23
Chapter Test	–	C-5-6
Past Solved Papers		

Chapter 4

Coding-Decoding

INTRODUCTION

In this segment of commonsense reasoning, secret messages or words have to be decoded. They are coded as per a definite pattern/ rule which should be identified first. Then the same is applied to decode another coded word.

TYPE-1 CODING BY LETTER SHIFTING

Pattern 1:

Coding in forward sequence

EXAMPLE 1. If 'GOOD' is coded as 'HPPE', then how will you code 'BOLD'?

Sol. Here,every letter of the word 'GOOD' shifts one place in forward alphabetical sequence.

G	O	O	D
+1 ↓	+1 ↓	+1 ↓	+1 ↓
H	P	P	E

Similarly, every letter in the word 'BOLD' will move one place in forward alphabetical sequence as given below:

B	O	L	D
+1 ↓	+1 ↓	+1 ↓	+1 ↓
C	P	M	E

∴ Code for 'BOLD' will be 'CPME'.

Pattern 2:

Coding in backward sequence.

EXAMPLE 2. If 'NAME' is coded as 'MZLD', then how will code 'SAME'?

Sol. Here, every letter of the word 'MZLD' moves one place in backward alphabet sequence. Let us see:

N	A	M	E
–1 ↓	–1 ↓	–1 ↓	–1 ↓
M	Z	L	D

Similarly, every letter of the word 'SAME' will move one place in backward alphabet sequence. Let us see :

S	A	M	E
–1 ↓	–1 ↓	–1 ↓	–1 ↓
R	Z	L	D

∴ Code for 'SAME' will be 'RZLD'.

Pattern 3:

Coding based on skipped sequence.

EXAMPLE 3. If the word 'FACT' is coded as 'IDFW'; then how will you code 'DEEP'?

Sol. Here, every letter of the word shifts three place in forward alphabetical order.

F	A	C	T
+3 ↓	+3 ↓	+3 ↓	+3 ↓
I	D	F	W

Similarly, 'DEEP' can be coded. Let us see :

D	E	E	P
+3 ↓	+3 ↓	+3 ↓	+3 ↓
G	H	H	S

∴ Code for 'DEEP' will be 'GHHS'.

❑ Shortcut Approach

- Observe alphabets given in the code carefully.
- Find the sequence it follows whether it is ascending/descending
- Detect the rule in which the alphabets follow.
- Fill the appropriate letter in the blank given.

TYPE-2 : CODING BY SUBSTITUTION

In this coding, some words are replaced by some substituted words and on the basis of substituted word the code is derived.

EXAMPLE 4. If 'cages' are called 'rockets', 'rockets' are called 'traps', 'traps' are called 'planets', 'planets' are called 'aeroplanes', 'aeroplanes' are called 'cycles' are cycles' are called 'cars', what is Earth

(a) Cycles (b) Rockets
(c) Planet (d) Aeroplanes
(e) Cars

Sol. Earth is a planet and here planets are called aeroplanes. So, earth will be called aeroplanes.

TYPE-3 : CODING BY REVERSING LETTERS

In this coding, all letters of a word has been reversed.

EXAMPLE 5. If 'TEMPERATURE' is coded as 'ERUTAREPMET', then how will you code 'EDUCATION' following the same scheme.

Sol. Here, the word 'TEMPERATURE' has been reversed. Hence, the code for 'EDUCATION' will be 'NOITACUDE'.

TYPE 4 : CODING IN FICTION LANGUAGE

In some cases of coding-decoding, fictions language is used to code some words. In such questions, the codes for a group of words is given. In such types of problems, codes for each word can be found by eliminating the common words.

EXAMPLE 6. In a certain code language 'over and above' is written as 'da pa ta' and 'old and beautiful' is written as 'Sa na pa'. How is 'over' written in that code language?

Sol. Over (and) above → da (Pa) ta

Old (and) beautiful → Sa na (Pa)

Clearly, 'and' is common in both and a common code is 'Pa'.

∴ Code for 'and' must be 'Pa'.

Code for 'over' = 'da' or 'ta'.

Code for above = 'da' or 'ta'.

Code for old = 'Sa' or 'na'

Code for beautiful = 'Sa' or 'na'

∴ We can't certainly say what will be exact code for 'over'. But it is sure that code for 'over' must be either 'da' or 'ta'.

❑ Shortcut Approach

- Firstly, write the words and their codes as given in the question in straight line with an arrow in middle.

- Now, find the common words and their corresponding codes.
- Encircle each pair with the same shape.
- Finally, we have each word and its corresponding code.

TYPE-5 : CODING BASED ON NUMBERS

Pattern 1:

When numerical values are given to words.

EXAMPLE 7. If in a certain language A is coded as 1, B is coded as 2. C is coded as 3 and so on, then find the code for AEECD.

Sol. As given the letters are coded as below:

A	B	C	D	E	F	G	H	I
1	2	3	4	5	6	7	8	9

Now,

A	E	E	C	D
1	5	5	3	4

∴ Code for AEECD = 15534

Shortcut Approach

- First you have to observe the number code.
- Now, notice the position of number.
- Search the common pattern.

Pattern 2:

When alphabetical code value are given for numbers.

EXAMPLE 8. In a certain code 3 is coded as 'R', 4 is coded as 'D', 5 is coded as 'N', 6 is coded as 'P', then find the code for '53446'.

Sol. As per the given condition

3	4	5	6
R	D	N	P

Now,

5	3	4	4	6
N	R	D	D	P

∴ Code for 53446 = NRDDP.

TYPE-6 : MATHEMATICAL OPERATIONS WITH THE POSITION NUMBERS OF LETTERS

EXAMPLE 9. In a certain code, if 'TALE' is written as 38, then how will you code 'CAME' using the same coding scheme?

Sol. Look at the numbered alphabet and write down the number corresponding to the letters of the word 'TALE'.

T A L E

20 1 12 5

The fact that the code for 'TALE' is 38, gives you a clue that the code is probably obtained by performing an arithmatical operations of the numbers of each other. Let us see :

$20 + 1 + 12 + 5 = 38$

Thus, the code for 'CAME' is

C A M E

$3 + 1 + 13 + 5 = 22$

∴ Code for 'CAME' = 22

Remember

- If the letters in the code look the same as in the original text, it will be a scramble type coding.
- If more than one codes are given then likely the required code can be drived from the question itself and you will not need to solve it mathematically.
- If the code for a word is a one digit number then likely the position of the letters are added and the digits are summed up until the one digit number is arrived at.

TYPE-7 : MATRIX CODING

In this type of questions two matrices are given. In each matrix there are 25 cells and these cells contain two classes of alphabets. The columns and rows of matrix I are numbered from 0 to 4 and that of matrix II from 5 to 9. A letter from these matrices can be represented first by its row number and next by its column number. For example. 'A' Can be represented by 32 or 43.

EXAMPLE 10.

Directions: In each of the following questions find out the correct set of number pairs for the given word from the two matrices given above.

Matrix I

	0	1	2	3	4
0	I	A	U	E	O
1	E	U	O	A	I
2	O	A	I	E	U
3	E	U	A	O	I
4	E	I	O	A	U

Matrix II

	5	6	7	8	9
5	K	R	L	M	N
6	M	R	K	N	L
7	K	N	M	L	R
8	M	L	K	R	N
9	N	R	L	K	M

1. MONK
   (a) 58, 33, 67, 98
   (b) 65, 02, 59, 67
   (c) 65, 04, 89, 75
   (d) 65, 20, 89, 68

Sol.

A → 01, 13, 21, 32, 43
E → 03, 10, 23, 30, 40
I → 00, 14, 22, 34, 41
O → 04, 12, 20, 33, 42
U → 02, 11, 24, 31, 44
K → 55, 67, 75, 87, 98
L → 57, 69, 78, 86, 97
M → 58, 65, 77, 85, 99
N → 59, 68, 76, 89, 95
R → 56, 66, 79, 88, 96

So, 65, 04, 89, 75 is correct

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-24-34
Chapter Test	–	C-7- 8
Past Solved Papers		

Chapter 5

Blood Relations

INTRODUCTION

Blood relation does mean biological relation. Remember a wife and husband are met biologically related but they are biological parents of their own children. Similarly, brother, sister, paternal grandfather, paternal grandmother maternal grandfather, maternal grandmother, grandson, granddaughter, niece, cousin etc. are our blood relatives.

TYPES OF BLOOD RELATIONS

There are mainly two types of blood relatives:

(i) Blood relation from paternal side
(ii) Blood relation from maternal side

(i) Blood relation from paternal side:

This type of blood relation can be further subdivided into three types:

(a) Past generations of father : Great grandfather, great grandmother, grandfather, grandmother etc.

(b) Parallel generations of father: Uncles (Brothers of father), Aunts (sisters of father) etc.

(c) Future generations of father: Sons, daughters, grandsons, granddaughters etc.

(ii) Blood relation from maternal side:

This type of blood relations can also be subdivided into three types:

(a) Past generations of mother: Maternal great grandfather, maternal great grandmother, maternal grandfather, maternal grandmother etc.

(b) Parallel generations of mother: Maternal uncles, maternal aunts etc.

(c) Future generations of mother: Sons, daughters, grandsons, granddaughters etc.

Table of Blood Relations

1	Son of father or mother		Brother
2	Daughter of father or mother		Sister
3	Brother of father		Uncle
4	Brother of mother		Maternal uncle
5	Sister of father		Aunt
6	Sister of mother		Aunt
7	Father of father		Grandfather
8	Father of father's father		Great grand father
9	Father of grandfather		Great grandfather

10	Mother of father	Grandmother
11	Mother of father's mother	Great grandmother
12	Mother of grandmother	Great grandmother
13	Father of mother	Maternal grandfather
14	Father of mother's father	Great maternal grand father
15	Father of maternal grandfather	Great maternal grandfather
16	Mother of mother	Maternal grandmother
17	Mother of mother, mother	Great maternal grandmother
18	Mother of maternal grandmother	Great maternal grandmother
19	Wife of father	Mother
20	Husband of mother	Father
21	Wife of Grandfather	Grandmother
22	Husband of Grandmother	Grandfather
23	Wife of son	Daughter-in-law
24	Husband of daughter	Son-in-law
25	Brother of Husband	Brother-in-law
26	Brother of wife	Brother-in-law
27	Sister of Husband	Sister-in-law
28	Sister of wife	Sister-in-law
29	Son of brother	Nephew
30	Daughter of brother	Niece
31	Wife of brother	Sister-in-law
32	Husband of sister	Brother-in-law
33	Son of sister	Nephew
34	Daughter of sister	Niece
35	Wife of uncle	Aunt
36	Wife of maternal uncle	Aunt
37	Son/daughter of uncle/Aunt	Cousin
38	Son/daughter of maternal uncle/maternal aunt	Cousin
39	Son/daughter of sister of Fathar	Cousin
40	Son/daughter of sister of Mother	Cousin

41	Only son of grandfather		Father
42	Only daughter of maternal		Mother
	grandfather		
43	Daughter of grandfather		Aunt
44	Sons of grandfather other		Uncle
	than father		
45	Son of maternal grandfather		Maternal Uncle.
	/maternal grand mother		
46	Only daughter in law of		Mother
	grandfather/ grandmother		
47	Daughters in law of		Aunt other than mother
	grandfather/ grandmother		
48	Daughters-in-law of		Aunt maternal
	maternal grandfather/		grandmother
49	Neither brother nor sister		Self

Some Important Information about Blood Relation

A. Without the information of gender, no relationship can be established between two people. For example, If given that R is the child of P & Q, then we can only say that P & Q are the parents of R. But we can not find out:

(i) R is the son of P & Q or R is the daughter of P & Q.

(ii) Who is mother of R and who is father of R.

But if we have given that P is a male, Q is a female and R is male, then we can easily say that R is the son of P and Q. Further we can also say that P is father of R and Q is mother of R.

B. Gender can not be decided on the basis of name. For example, in Sikh community the names like Manjit, Sukhvinder etc. are the names of both male and female. Similarly, in the Hindu Community 'Suman' is the name of both male and female.

❑ *Shortcut Approach*

- While solving blood relation based question, first of all find out that two persons between whom a relationship has to be established.
- Next, try to find out middle relation.
- Finally, find out the relationship between two persons to be identified for this purpose.

TYPES OF PROBLEMS

(1) General Problems on Blood Relation
(2) Blood Relation based on Family Tree
(3) Coded Blood Relation

(1) General Problem on Blood Relation

EXAMPLE **1.** Pointing towards a photograph, Mr. Sharma said, "She is the

only daughter of mother of my brother's sister." How is Mr. Sharma related to the lady in the photograph?

Sol. Here, we have to find relationship between Mr. Sharma & the lady in the photograph.
Mother of my brother's sister does mean my (Mr. Sharma's) mother. Only daughter of Mr. Sharma's mother does mean "sister of Mr. Sharma".

❑ *Shortcut Approach*

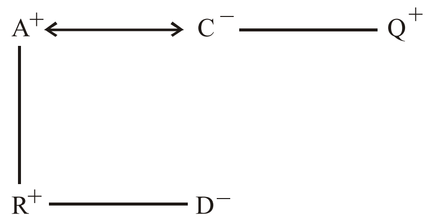
- Read the statement from right to left to develop the relation by using blood relation table.

(2) Blood Relation based on Family Tree

EXAMPLE 2. Q is the brother of C and C is the sister of Q. R and D are brother and sister. R is the son of A while A & C are wife and husband. How is Q related with D.

Sol. For such type of question a family tree is made in which some symbols are used as below:
'⇔' is used for husband & wife.
'___' is used for brother & sister
' | ' is used for parents (father or mother). Parents are put on top while children are put at the bottom.
'–' or minus sign is used for female
'+' or plus sign is used for male.
Now, adopting and using the above given symbols we can make a family tree and solve the given problem, let us see the family tree :

Family tree :



As per the question Q is the brother of C and C is the sister of Q. Hence, relation between C & Q has been presented as $\left(C^{-} — Q^{+}\right)$ where '–' sign above C makes it clear that C is a female and '+' sign above 'Q' makes it clear that Q is a male. Similarly, for R and D. The presentation $\left(\overset{+}{R} — D^{-}\right)$ has been made. Further according to the question, A and C are having a husband and wife relationship and hence this has been presented as $\left(\overset{+}{A} \Leftrightarrow C^{-}\right)$. As it is already given that C is the sister of Q and A and C are wife and husband, this becomes clear that A is the male member of the family and this is the reason A has '+' as its gender sign. Lastly, the vertical line gives father and son relationship and has been presented as $\left(\begin{array}{c} A^{+} \\ | \\ R^{+} \end{array}\right)$. Now from this family tree it becomes clear that C is the mother of R and D and as Q is the brother of C, then Q will definitely be the maternal uncle of R & D. Hence, we can say that Q is the maternal uncle of D and this is the required answer for our question.

❑ Shorcut Approach

- Follow the symbols for male (+) and (–) female.
- Remember the generations and relations.

Note : *In solving family tree based relations make sure that your diagram is in correct representation.*

(3) Codded Blood Relations –

EXAMPLE **3.** If P + Q means P is husband of Q, P/Q means P is the sister of Q, P*Q means P is the son of Q. flow is D related to A in D*B + C/A ?

Sol. C/A – C is sister of A.

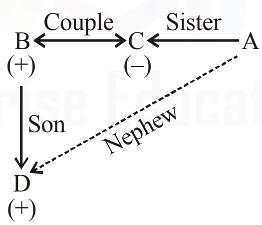
B + C/A – B is brother-in-law of A (Sister's husband – broter-in-law)

D*B + C/A – D is nephew of A (Sister's husband's son means sister's son i.e., nephew)

So, D is nephew to A.

Shortcut Method :

By using symbols and generation relations :



So, it is clearly shown that D is nephew to A.

❑ Shortcut Approach

- The best way to solve blood relation questions, you try and relate every statement to 'yourself'. The starting name of the statement could be assumed as your name or you.
- When the statement is very long, it can get confusing. So, break down every statement in the question into sub statements and solve the question.
- Do not assume the gender of any person in the question just based on the names given in the question.
- Draw a family tree where people of the same generation are placed at the same level and the entire diagram is in the form of a hierarchy.

Remember

- Concentrate on points which give maximum definite information.
- Read the questions carefully and try identifying the persons between whom relationship is to be established. Possibly put yourself in given character so that it becomes easy for you to understand.
- Whilst concluding the relationship between two people be careful about the gender of the person being talked about as it is possible to commit mistake by assuming the gender of the person which is not given in the data or which can't be extracted from the data/ information given.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-35-39
Chapter Test	–	C-9- 10
Past Solved Papers		

Chapter 6

Direction and Distance

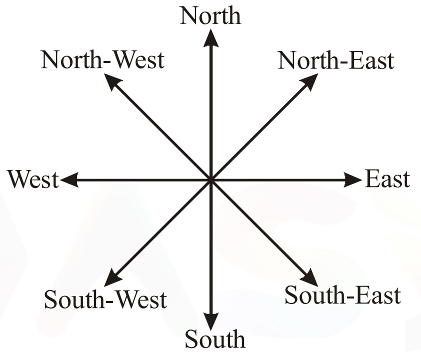
INTRODUCTION

This part of reasoning comes under the category of common sense reasoning. In fact, this segment gauges the sense of direction of a candidate.

CONCEPT OF DIRECTION

In our day to day life, we make our concept of direction after seeing the position of sun. In fact, this is a truth that sun rises in the East and goes down in the West. Thus when we stand facing sunrise, then our front is called East while our back is called West. At this position our left hand is in the Northward and the right hand is in the Southward. Let us see the following direction map that will make your concept more clear.

Direction Map



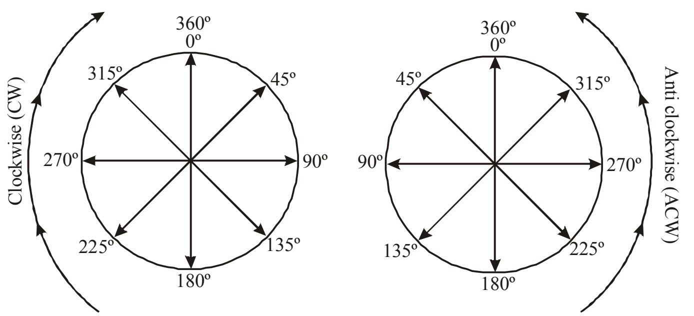
❑ *Shortcut Approach*

To remember four main directions, always remember the word 'NEWS.'

Note: *On paper North is always on top be while South is always in bottom.*

CONCEPT OF DEGREE

Let us see the following picture:

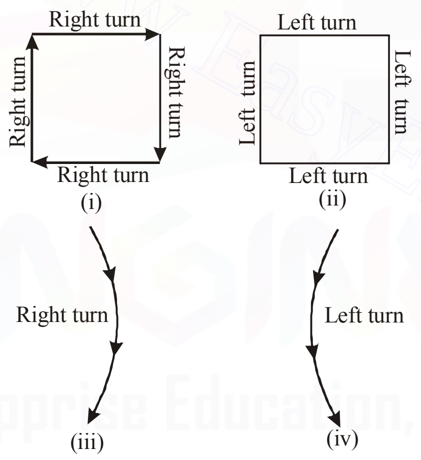


Remember

- Angle between two consecutive main directions is always 90°.
- Angle between two consecutive subdirections is always 90°.
- Angle between a main direction and a subdirection is always 90°.

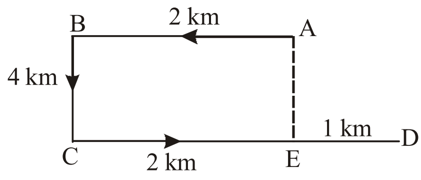
CONCEPT OF TURN

Right turn = Clockwise turn
Left turn = Anticlockwise turn
Let us understand it through pictorial representation:



EXAMPLE 1. Raman walked 2 km West from his office and then turned South covering 4 km. Finally, he waked 3 km towards East and again move 1 km West. How far is Raman from his initial position.

Sol. Raman starts from his office A, moves 2 km West upto B, then 4 km to the South upto C, 3 km East upto D and finally 1 km West upto E, Thus his distance from the initial position AE = BC = 4 km.



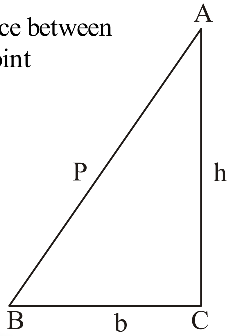
Remember

- If our face is towards North, than after left turn our face will be towards West while after right turn, it will be towards East.
- If our face is towards South, then after left turn our face will be towards East and after right turn it will be towards West.
- If our face is towards East, then after left turn our face will be forwards North and after right turn it will be towards South.
- If our face is towards West, then after left turn our face will be towards South and after right turn it will be towards North.
- If our face is towards North-West, then after left turn our face will be towards South-West and after right turn it will be towards North-East.
- If our face is towards South-West, then after left turn our face will be towards South-East and after right turn it will be towards North-West.
- If our face is towards South-East, then after left turn our face will be towards North-East and after right turn it will be towards South-West.
- If our face is towards North-East, then after left turn our face will be towards North-West and after right-turn it will be towards South-East.

CONCEPT OF MINIMUM DISTANCE

Minimum distance between initial and last point

$$h^2 = b^2 + P^2$$



where,

h = Hypotenuse

b = Base

P = Perpendicular

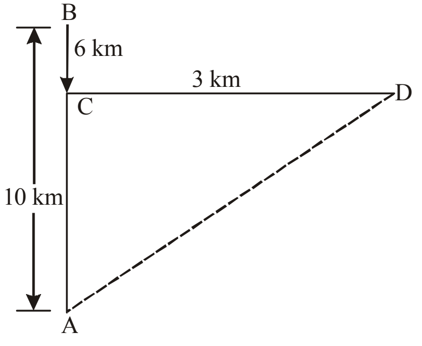
Remember this important rule is known as '**Pythogoras Theorem**'

EXAMPLE 2. Rashmi walks 10 km towards North. She walks 6 km towards South then. From here she moves 3 km towards East. How far and in which direction is she with reference to her starting point?

Sol. It is clear, Rashmi moves from A 10 km Northwards upto B, then moves 6 km Southwards upto C, then turns towards East and walks 3 km upto D.

Then, $AC = (AB - BC) = 10 - 6 = 4$ km

$CD = 3$km.



∴ Rashmi's distance from starting point A

$$= AD = \sqrt{AC^2 + CD^2} = \sqrt{4^2 + 3^2}$$

$$= \sqrt{16 + 9} = \sqrt{25} = 5\,\text{km}.$$

From figure, D is to the North-East of A.

SHADOW CASE

In Morning/Sunrise Time

(a) If a person facing towards Sun, the shadow will be towards his back or in West.

(b) If a person facing towards South, the shadow will be towards his right.

(c) If a person facing towards West, the shadow will be towards his front.

(d) If a person facing towards North, the shadow will be towards his left.

In Evening/Sunset Time

(a) If a person facing towards Sun, the shadow will be towards his back or in East.

(b) If a person facing towards North, the shadow will be towards his right.

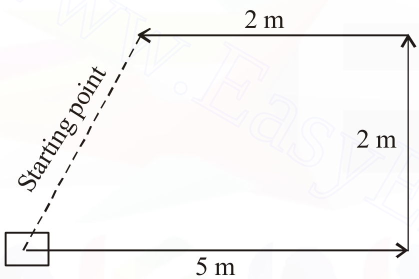
(c) If a person facing towards East, the shadow will be towards his front.

(e) If a person facing towards South, the shadow will be towards his left.

Note : *At 12:00 noon there is no shadow because the rays of the sun are vertically downward.*

EXAMPLE 3. Early morning after sunrise, Rajesh was standing infront of his house in such a way that his shadow as falling exactly behind him. He starts walking straight and walks 5 m. He turns to his left and walks 3 m and again turning to his left walks 2m. Now in which direction is he from his starting point?

Sol. The shadow of Rajesh was falling exactly behind him. So, he was facing towards East. Diagram clearly shows that Rajesh was in North-East with reference to the starting point.



❑ Shortcut Approach

- Draw four lines and write all directions on each edge of it same.
- Think the 'you' are standing at all arrow head facing outward from centre.
- Read the statement line by line.
- Move yourself as per statement asked and prepare a diagram as per line by line statement.
- Show, check and verify the direction and distance of you from starting point.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-40-45
Chapter Test	–	C-11- 12
Past Solved Papers		

Chapter 7

Time Sequence, Number & Ranking Test

TIME SEQUENCE

In time sequence, we have to defect exact time from the given time sequence.

To solve problems related to time sequence, let us gather first the following informations :

1 Minute = 60 seconds
1 Hour = 60 minutes
1 Day = 24 hours
1 Week = 7 days
1 Month = 4 weeks
1 Year = 12 months
1 Ordinary year = 365 days
1 Leap year =366 days
1 Century = 100 years

Remember

- A day is the period of the earth's revolution on its axis.
- A 'Solar year' is the time taken the earth to travel round the sun. It is equal to 365 days, 5 hours, 48 minutes and $47\frac{1}{2}$ seconds nearly.
- A 'Lunar month' is the time taken by the moon to travel round the earth. It is equal to nearly 28 days.

Leap Year

- If the number of a given year is divisible by 4, it is a leap year. Hence, the years like 1996, 2008, 2012 are leap years. But years like 1997, 1991, 2005, 2007 are not divisible by 4 and therefore, such years are not leap years.
- In a leap year, February has 29 days.
- A leap year has 52 weeks and 2 days. Therefore, a leap year has 2 odd days.

Ordinary year

- An ordinary year has 12 months.
- An ordinary year has 365 days.
- An ordinary year has 52 weeks and 1 day. Therefore, an ordinary year has 1 odd day.

CENTURY (100 YEARS)

- A century has 76 ordinary years and 24 leap years.
- A century has 5 odd days.

Odd days

Odd days in an ordinary year = 1
Odd days in a leap year = 2
Odd days in 100 years = 5
Odd days in 200 years = (5 × 2)
= 1 week + 3 days = 3
Odd days in 300 years = (5 × 3)
= 2 weeks + 1 day = 1
Odd days in 400 years = (5 × 4 + 1)
= 21 days
= 3 weeks + 0 day = 0

Similarly, each 800, 1600, 2000, 2004, etc. has 0 odd days.

EXAMPLE 1. Neena returned home after 3 days earlier than the time she had told her mother. Neena's sister Veena reached five days later than the day Neena was supposed to return. If Neena returned on Thursday, on what day did Veena return ?

Sol. Neena returned home on Thursday. Neena was supposed to return 3 days later, i.e., on Sunday.
Veena returned five days later from Sunday. i.e., on Friday.

NUMBER TEST

In such test, generally you are given a long series of numbers. The candidate is required to find out how many times a number satifying the conditions specified in the question occurs.

EXAMPLE 2. How many 8s are there in the following number sequence which are immediately preceded by 5 but not immediately followed by 3?

3 8 5 8 4 5 8 3 9 8 8 5 8 8 8 9 3

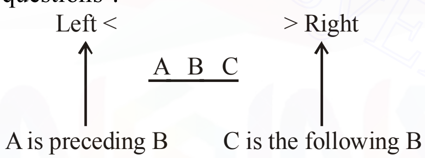
Sol. Let use see the following :

3 8 8 4 5 **8** 3 9 8 8 5 **8** 8 8 93

Clearly, two such 8s are there.

Remember

There is no rule as how to attempt these questions but we can practice these questions :



RANKING TEST

In such problems, the ranks of a person both from the top and from the bottom are given and on the basis of this the total number of persons is asked. Sometimes question is twisted also and position of a particular person is asked.

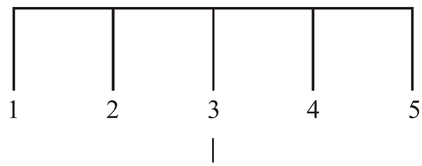
❑ Shortcut Approach

Formulas to determine the positioning of a person

(1) Left + Right = Total + 1
(2) Left = Total + 1 – Right
(3) Right = 1 + 1 – left
(4) Total = left + Right

Note : *The above formulas are only for a single person's position*

EXAMPLE



3rd from left
3rd from right
Total = 3 + 3 – 1

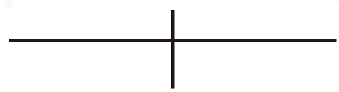
❑ Shortcut Approach

Same for Vertical & Horizontal

(1) Total + 1 = Top + Bottom
(2) Top = Total + 1 – Bottom
(3) Botom = Total + 1 – Top
(4) Total = Top + Bottom

EXAMPLE 3. In a row of 40 students, A is 13th from the left end, find the rank from right end.

Sol. Total = 40



A
13L

A's rank from right side
= Total + 1 – left
= 40 – 13 + 1
= 27 + 1
= 28

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-46-50
Chapter Test	–	C-13-14
Past Solved Papers		

Chapter 8

Logical Sequence of Words

INTRODUCTION

In this particular type of problems, certain inter-related words are given and numbered, followed by various sequences of the numbers denoting them, as alternatives.

TYPES OF SEQUENCE

(i) Sequence of occurence of events or various stages in a process.

EXAMPLE 1. Consultation
2. Illness
3. Doctor
4. Treatment
5. Recovery

Sol. Clearly illness occurs first. One then goes to a doctor and after consultation with him, undergoes treatment to finally attain recovery.

(ii) Sequence of objects in a class or group

EXAMPLE 1. Member
2. Country
3. Community
4. Family
5. Locality

Sol. Member → Family → Community→ Locality→ Country

(iii) Sequence in Ascending or Descending order

EXAMPLE 1. Furniture
2. Forest
3. Wood
4. Country
5. Trees

Sol. Country → Forest → Trees→ Wood → Furniture.

(iv) Sequential order of words According to Dictionary

EXAMPLE 1. Direct
2. Divide
3. Divest
4. Devine
5. Divisons

Sol. Devine → Direct → Divest → Divide → Divisons.

❑ Shortcut Approach

- Remember all English alphabets in forward and reverse order
- Knowledge of our nature or surroundings

ebooks Reference		Page No.
Practice Exercises with Hints & Solutions	–	P-51-54
Chapter Test	–	C-15-16
Past Solved Papers		

Chapter 9

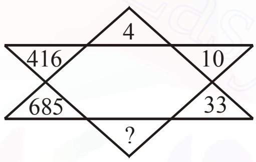
Number Puzzles

INTRODUCTION

In this, the questions are based on different number. This type of problem having figure which follows a particular rule for their different number. We have then asked to find a missing number by using same rule.

TYPES OF NUMBER PUZZLE

PATTERN 1 : SINGLE FIGURE PATTERN

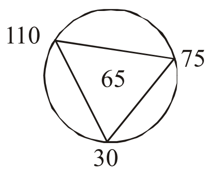


Here, a clockwise pattern is being followed. If we move clockwise we can see that numbers are increasing. If we observe it more closely, we can crack the pattern which is

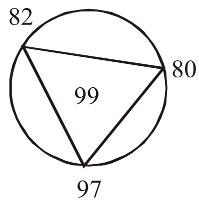
As, $4 \times 2 + 2 = 10$, $10 \times 3 + 3 = 33$

So, $33 \times 4 + 4 = 136$

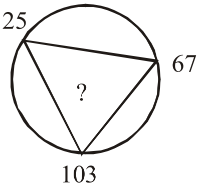
PATTERN 2 : MULTIPLE FIGURE PATTERN



(i)



(ii)



(iii)

Here, a series of figure is given. Checking the pattern in the first two figures, we have to find missing number in the third. If we observe the first two figure properly, we get an idea of the pattern.

As, $110 + 30 - 75 = 65$, $97 + 82 - 80 = 99$

So, $103 + 25 - 67 = 61$.

❑ *Shortcut Approach*

- The first step is to observe the figure and check if there is any familiar pattern in the given question.
- The second step is finding out the pattern.
- Ther is no need to memorize any pattern.
- All you need is to understand the concept and decipher the pattern.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-55-61
Chapter Test	–	C-17- 18
Past Solved Papers		

Chapter 10

Venn Diagram

INTRODUCTION

Venn diagrams are pictorial way of represent the set of article. There are different regions which needs proper understanding for solving problems based on given Venn diagrams.

TYPES OF VENN DIAGRAM

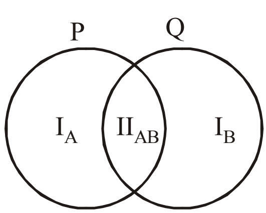
- Analysis Based Venn Diagram
- Identification of Relation Based Venn Diagram

(i) ANALYSIS BASED VENN DIAGRAM -

In this type, generally a venn diagram comprising of different geometrical figures is given. Each geometrical figure in the diagram represents a certain class.

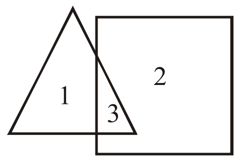
❑ Shortcut Approach

Case - I:
Two articles:



Here, I_A represents only P
I_B represents only Q
II_{AB} represents P and Q

EXAMPLE



△ – represents student passed in English

□ – represents student passed in Reasoning.

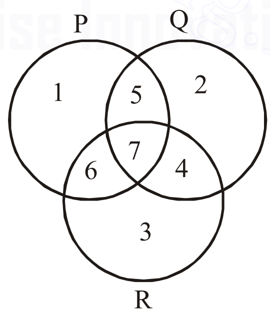
1 – represents student passed in English only

2 – represents student passed in Reasoning only

3 – represents student passed in both English Reasoning both.

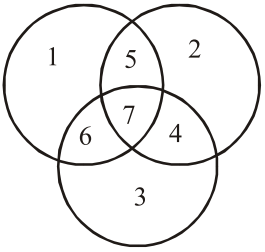
❑ Shortcut Approach

Case: - II Three articles



1 – represents P only
2 – represents Q only
3 – represents R only
4 – represents Q and R (not P)
5 – represents P and Q (not R)
6 – represents P and R (not Q)
7 – represents P, Q and R

EXAMPLE



1 → Engineer

2 → Doctor

3 → Farmer

4 → Doctor who is farmer also

5 → Engineer who is doctor also

6 → Engineer who is farmer also

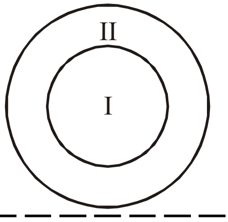
7 → Person who is Engineer, doctor and farmer.

(ii) Identification of Relation Based Venn Diagram -

In this type, some standard representations for groups of three items with different cases of venn diagrams are given.

❑ *Shortcut Approach*

When one class of items is completely included in the another class of item then it is represented by the given diagram



EXAMPLE

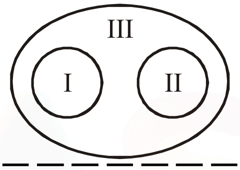
I – Mango

II – Fruit

Here, all mango are fruit.

❑ *Shortcut Approach*

If two classes of item are completely different from each other but they all are completely included in third class then the relationship is represent of the diagram.



EXAMPLE

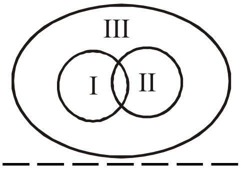
I – represent potato

II – represent onion

III – represent vegetable

❑ *Shortcut Approach*

- **If two group of items having some common relationship and both of them are all included in third class then the relationship is represented by the diagram.**



EXAMPLE Brother, Father, Male.

I → Brother

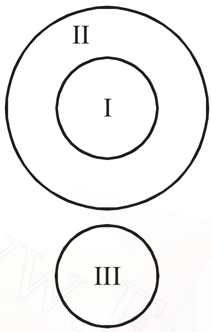
II → Father

III → Male

Some Brother may be Father and all are male.

❑ Shortcut Approach

When one class of item is completely included in another group while third is not related to both of them then such condition are diagrammati-cally represented by

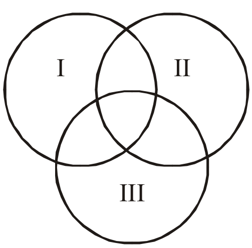


EXAMPLE

Cricketer, player and farmer
I – Cricketer
II – Player
III – Farmer
All cricketers are players but farmers not.

❑ Shortcut Approach

If three group of things are related to each other

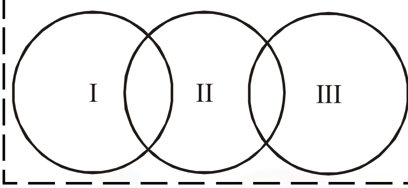


EXAMPLE

Graduate, Engineer and Doctor
Graduate may be Engineer and Doctor.

❑ Shortcut Approach

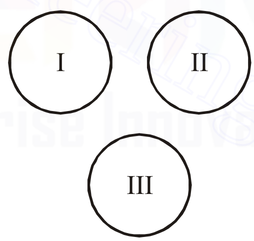
When two group of items are completely unrelated to each other while they are partly related with third group of item



EXAMPLE Cloth, Red, Flowers.
Some cloth are Red and also some Flowers are red.

❑ Shortcut Approach

When group of items are completely different from each other



EXAMPLE

Red, Yellow, Black
These are all different colour.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-62-67
Chapter Test	–	C-19- 20
Past Solved Papers		

Chapter 11

Mathematical Operation Arithmetical Reasoning

INTRODUCTION

In this type of problem, usually mathematical symbol are converted into another form by either interchanging the symbol or using different symbol in place of usual symbol and then calculate the equation according to the given condition.

Remember

While simplifying a mathematical problem follow 'VBODMAS' rule

V - Viniculum bracket

B - Bracket

O - Of

D - Division

M - Multiplication

A - Addition

S - Subtraction

TYPES OF MATHEMATICAL OPERATION

(i) SYMBOL SUBSTITUTION

In this, various mathematical symbols, followed by a question involving calculation of an expression. It is required to put in the real signs in the given equation and then solve the question.

EXAMPLE 1. If '+' stands for division, '×' stands for addition, '–' stands for multiplication, and '÷' stands for subtraction, then which of the following equation is correct?

(a) $36 \times 6 + 7 \div 2 - 6 = 20$

(b) $36 + 6 - 3 \times 5 \div 3 = 24$

(c) $36 \div 6 + 3 \times 5 - 3 = 45$

(d) $36 - 6 + 3 \times 5 \div 3 = 74$

Sol. $36 \times 6 \div 3 + 5 - 3$

$\Rightarrow 36 \times 2 + 5 - 3 = 74$

(ii) INTERCHANGE OF SIGNS & NUMBERS

In this, the given equation becomes correct and fully balanced when either two signs of the equation or both the numbers and the signs of the equations are interchanged.

EXAMPLE 2. Given interchange : sign '+' and '–'and numbers 5 and 8. Which of the following is correct?

(a) $82 - 35 + 55 = 2$

(b) $82 - 35 + 55 = 102$

(c) $85 - 38 + 85 = 132$

(d) $52 - 35 + 55 = 72$

Sol. $52 + 38 - 88 = 2$

(iii) BALANCINGTHE EQUATION

In this, the signs given in one of the alternatives are required to full up the blank spaces for the signs in order to balance the given equation.

EXAMPLE 3. Select correct combination of mathematical sign to replace '*' sign to balance the equation.

9 * 4 * 22 * 14

(a) × = –

(b) × – =

(c) = – ×

(d) – × =

Sol. 9 * 4 * 22 * 14

9 × 4 – 22 = 14

❑ ***Shortcut Approach***

- Begin with replacing coded operators with their meanings. Write the entire expressions with correct operators and operand.
- When sowing always remember VBODMAS.
- If any interchnages are suggested, apply then before you start soling.

ARITHMETICAL REASONING

Arithmetical Reasoning tests the ability to solve basic arithmetic problems encountered in everyday life. These problems require basic mathematical skills like addition, subtraction, multiplication, division etc. The tests include operations with whole numbers, rational numbers, average ratio and proportion, interest and percentage, and measurement. Arithmetical reasoning is one factor that helps characterize mathematics comprehension, and it also assesses logical thinking.

EXAMPLE 4 : The total of the ages of Amar, Akbar and Anthony is 80 years. What was the total of their ages three years ago ?

Sol. Here, required sum = (80 – 3 x 3) years = (80 – 9) years

= 71 years.

❑ ***Shortcut Approach***

If ages of n persons in a group are x_1, x_2, x_3 ... , xn yr, then average age of the group

$$= \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-68-74
Chapter Test	–	C-21-22
Past Solved Papers		

Chapter 12

Coded Inequalities

INTRODUCTION

As we know,

$$3 \times 3 = 9$$

Now, we can say that the result of multiplication between 3 and 3 is equal to 9. Therefore, $3 \times 3 = 9$ is a case of equality. But when we multiply 3×4, we get 12 as a result of this multiplication. It does mean that

$$3 \times 4 \neq 9$$

As 3×4, is not equal to 9, it is a case of inequality.

When, we come to know that one thing is not equal to another; there can be only two possibilities:-

(i) One thing is greater than another thing.

or

(ii) One thing is less than the another thing.

When, we denote (i) and (ii) mathematically, then we will write.

(i) One thing > another thing.

or

(ii) One thing < another thing.

where '>' denotes 'greater than'.

and '<' denotes 'less than'

Hence, you can write,

$3 \times 4 > 9$

$4 \times 1 < 9$

($3 \times 4 > 9$) means 'Product of 3 and 4 is greater than 9'.

($4 \times 1 < 9$) means 'Product of 4 and 1 is less than 9'.

Sometimes we come across two numbers where, we do not know the exact state of inequality between them.

Let us see :

$m \geq n$ means m is either greater than or equal to n.

$m \leq n$ means n is either less or equal to m.

Hence, we can summarise the signs to be used in inequalities as below:

'=' denots equal to
'>' denots greater than
'≥' denots greater than or equal to
'<' denots less than
'≤' denots less than or equal to

CHAIN OF INEQUALITIES

Sometimes two or more inequalities are combined together to create a single inequality having three or more terms. Such combination is called chain of inequalities.

Note : *If you see the given problem format (Example). You will find that your primarily task is to combine two or more inequalities to create a single inequality.*

Conditions for Combining Two Inequalities

Condition I: Two inequalities will be combined if and only if they have a common term.

Condition II: Two inequalities will be combined if and only if the common term is greater than (or 'greater' than or equal to') one and less than (or 'less than or equal to') the other.

EXAMPLE 14 > 13, 13 > 12 can be easily combined as '14 > 13 > 12'.

Coded Inequalities

Here,

14 > (13) > 12
↓
Common term

Clearly, 14 > 13 and 13 > 12 have common term 13 and this common term is greater than 12 and less than 14. Hence, 14 > 13 and 13 > 12 have been combined into 14 > 13 > 12 as per the conditions I and II.

EXAMPLE 17 < 19, and 19 < 20 can be easily combined as 17 < 19 < 20.

Here,

17 < (19) < 20
↓
Common term

Clearly, 17 < 19 and 19 < 20 have common term 19 and this common term is greater than 17 and less than 20. Hence, 17 < 19 and 19 < 20 have been combined into 17 < 19 < 20 as per the conditions I and II.

Now, let us see some examples of inequalities which can not be combined. Some such examples are given below:

i. 14 > 12, 19 > 18

ii. 18 < 20, 22 < 25

iii. 100 > 99, 80 > 77

iv. 100 < 115, 118 < 119

Clearly, (i), (ii), (iii) and (iv) can not be combined as they do not have any common term and therefore, they do not follow condition I and condition II.

How to Derive Conclusions from a Combined Inequalities?

To derive conclusion from a combined inequality, you have to eliminate the common term.

For example,

(a) If we have

$m > \ell > n$

then, our conclusion is

$m > n$

(b) When, we have

$m < \ell < n$

then, our conclusion is

$m < n$

(c) When, we have '≥' signs in the combined inequalities then you have to think a little bit more. Let us consider the combined inequality given below:

$m \geq \ell > n$

Here, m is either greater than ℓ or equal to ℓ.

Hence, the minimum value for m is equal to ℓ. But ℓ is always greater than n. Therefore, m is always greater than n.

∴ Our conclusion is $m > n$

(d) When, we have the following inequalities:-

$m > \ell \geq n$

In this case, m is always greater than ℓ and ℓ is either greater than n or equal to it. When ℓ is greater than n; m will obviously be greater than n. Even when ℓ is equal to n; m will be greater than n as m is always greater than ℓ.

$\therefore$ Our conclusion is $\boxed{m > n}$

(e) When, we have combine inequality

$m \geq \ell \geq n$

Here, m is either greater than ℓ or equal to ℓ.

When m is greater than ℓ; we have $m > \ell \geq n$, which gives the conclusion.

$\boxed{m > n}$ — (A)

When m is equal to ℓ; we have

$m = \ell \geq n$, which gives the conclusion

$\boxed{m \geq n}$ — (B)

Combining (A) and (B), we have the final conclusion as

$\boxed{m \geq n}$

From (a), (b), (c), (d) and (e), we get a rule for deriving conclusions from a combined inequality, we may say it 'Golden Rule'.

GOLDEN RULE

The conclusion inequality will have an '≥' sign or a '≤' sign if and only if both the signs in the combined inequality are '≥' or '≤' sign

Clearly, in (a), (b), (c), (d) and (e) only one inequality (e) $(m \geq l \geq n)$ has '≥' as its both the sign.

Remember

- If $m > n$, then $n < m$ must be true.
- If $m < n$, then $n > m$ must be true.
- If $m \geq n$, then $n \leq m$ must be true.
- If $m \leq n$, then $n \geq m$ must be true.

EITHER CHOICE RULES

I. When your derived conclusion is of the type $m \geq n$ (or $m \leq n$) then check if the two conclusions are $m > n$ and $m = n$ (or, $m < n$ and $m = n$). If yes, choice "either follows" is true.

II. If neither of the given conclusions seems correct. Then try to check if the given conclusions form a complementary pair. Given conclusions form a complementary pair in the 4 cases given below:-

(i) $m \geq n$ and $m < n$
(ii) $m > n$ and $m \leq n$
(iii) $m \leq n$ and $m > n$
(iv) $m < n$ and $m \geq n$

In such case, the choice "either follows" is correct.

❑ Shortcut Approach

Steps for Solving Problems

Step I: Decode the given symbols like @, $, δ, #, *, etc.

Step II: Take one conclusion at a time and make an idea that which statements are relevant for evaluating it.

Step III: Use conditions I and II and the 'Golden Rule' to combine the relevant statements and derive a conclusion from it. They are:

Condition I: There must be a common term.

Condition II: The common term must be less than or equal to one term and greater than or equal to another.

GOLDEN RULE:

> The conclusion — inequality is obtained by letting the common term be eliminated and it has a '≥' or a '≤' sign if and only if both the inequalities in 2nd step had a '≥' or a '≤' sign. In all other cases, there will be a '>' or a '<' sign in the conclusion.

After performing the above mentioned three steps, if a conclusion is established and verified, it is well and good. But if does not happen so, then you have to perform 4 more new steps given below:

New Step I: Check if the given conclusion directly follows from anyone single statement.

New Step II: Check if the conclusion — inequality you get is essentially as same as the given conclusion but written differently.

New Step III: Check if the derived conclusion follows 'Either choice Rule I'.

New Step IV: If neither of the conclusions has been proved correct till now, then check 'Either choice Rule II'.

EXAMPLE 1 : In the following question, the symbols ©, @, =,* and $ are used with the following meanings :

P © Q means 'P is greater than Q';
P @ Q means 'P is greater than or equal to Q';
P = Q means 'P is equal to Q';
P * Q means 'P is smaller than Q';
P $ Q means 'P is either smaller than or equal to Q'.

Now in each of following questions, assuming the given statements to be true, find which of the two conclusions I and II given below them is/are definitely true.

Give answer :

(a) if only conclusion I is true;
(b) if only conclusion II is true;
(c) if either I or II is true;
(d) if neither I nor II is true.
(e) if both I and II are true.

Statements : P © T, M $ K, T = K

Conclusions : I. T © M II. T = M

Sol. Given statements :

$P > T, M \le K, T = K.$

$T = K, K \ge M \Rightarrow T \ge M$

$\Rightarrow T > M$ or $T = M$ ⎤ Complementary
$\Rightarrow$ T © M or $T = M$ ⎦ pair

So, either I or II is true.

DIRECT INEQUALITY

In this type of questions, direct relation between two or more than two elements are given in a meaningful inequality. Candidates are required to establish the relation between elements with the help of used signs between the elements.

EXAMPLE 2 : Which of the following symbols should replace the question mark in the given expression in order to make the expressions. 'I > L' as well as 'M ≥ K' definitely true?

$I > J \ge K \; ? \; L \le N = M$

(a) > (b) <
(c) ≤ (d) =
(e) Either < or ≤

Sol. On putting sign (=) in place of question mark (?)

$I > J \ge K = L \le N = M$

$\Rightarrow$ means $I > L$ and $M \ge K$

Remember

Inequality depends upon combining more than two element with a common term. Now observe the below diagram thoroughly

Accordance to this diagram

Definite Conclusion

- $> = \rightarrow >$
- $< = \rightarrow <$
- $\geq = \rightarrow \geq$
- $\leq = \rightarrow \leq$
- $\geq > \rightarrow >$
- $\leq < \rightarrow <$
- $< = \leq \rightarrow <$
- $> = \geq \rightarrow >$

Indefinite Conclusion

- $> < \rightarrow$ No relation
- $\geq \leq \rightarrow$ No relation
- $> \leq \rightarrow$ No relation
- $\geq < \rightarrow$ No relation

❑ Shortcut Approach

Case 1. < OR >

Two signs opposite to each other will make the conclusion wrong But again if the signs are in same manner that will not make it wrong.

EXAMPLE

If $A > B < C > D$ then $A < C$ = False, $C > A$ = False.

But

If $E > F > G > H$ then $E > G$ = True, $F > H$ = True, $E > H$ = True.

Statement: $A < D > C < E > B$

Conclusions:

- $C > B \rightarrow$ False
- $A < E \rightarrow$ False
- $D > B \rightarrow$ False

In simple way, whenever these two sign comes in opposite direction the answer will be false.

❑ Shortcut Approach

Case 2. ≤ OR ≥

Two signs opposite to each other will make the conclusion wrong But again if the signs are same then it will be true.

EXAMPLE

If $A \geq B \leq C$ then

$A \leq C$ = False, $C \geq A$ = False

But

If $A \geq B \geq C$ then

$A \geq C$ = True, $C \leq A$ = True.

Statement: $B \geq D \leq A \geq F \geq C$

Conclusions :

I. $A \geq C \rightarrow$ True

II. $B \leq F \rightarrow$ False

III. $D \geq C \rightarrow$ False

❑ Shortcut Approach

Case 3. Sets Priority

1st Priority : $<$ or $>$

2nd Priority: $\leq$ or $\geq$

3rd Priority: $=$

Statement: $P \geq R > Q = T \geq S$

Conclusions :

I. $P \geq Q \rightarrow$ False

II. $P > Q \rightarrow$ True

III. $Q \geq S \rightarrow$ True

Case 4.

When it occurs to you that the statement of order is opposite just change the sign into similar opposite direction. Then change the sign into similar opposite /corresponding / alternative direction.

If $A > B > F > C < D < E$

than $F < A \rightarrow$ True

EXAMPLE

$[\because A > B > F = F < B < A]$

Statements : $A > B > F > C; D > E > C$

Conclusions:

I. $C < A \rightarrow$ True

II. $C > A \rightarrow$ False

❑ Shortcut Approach

Case 5. > or < and ≥ or ≤

Whenever there is two conclusions which are false then check for these two symbols **(> or < and ≥ or ≤)**. In most of case where two conclusions are false and these two similar signs are not there respectively then that statement can call it as either or but should check there variable it should same.

(A) Either Or :

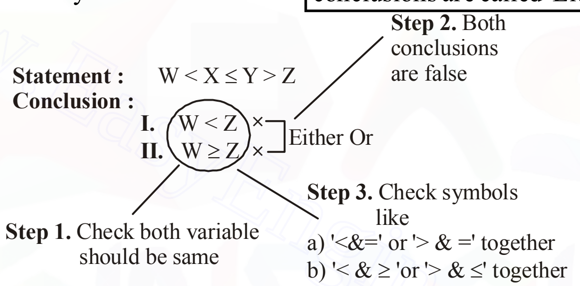
Note : First thing need to check whether in conclusion any two or more conclusions are wrong then if it is there then check whether the two variables are same. If It happens then write it as 'Either or' but after checking their symbols.

Rules:

1. Both conclusion should False
2. Should have same Predicate or Variable
3. Check the symbols

If above conditionsare satisfied then write it as 'Either Or' Other wise leave it.

Note : If Rule 3 is satisfied than the conclusions are called 'Either Or'.



EXAMPLE

Statement : H = W ≤ R > F
Conclusion : I. R = H, II. R > H — Either Or

Statement : H > L = E < T
Conclusion : I. H ≤ T, II. H > T — Either Or

Statement : S < T ≥ R ≥ M
Conclusion : I. M < T, II. M = T — Either Or

Statement : I ≥ H = T > S ≤ R
Conclusion: I. I > T, II. I = T — Either Or

B. Neither Nor :

First thing you need to check whether in your conclusion any 2 or more conclusions are wrong then write it as 'Neither Nor' but before checking their symbols.

Rules:

1. Both conclusion should False
2. Check the symbols

If both the rules are satisfied then write it as " Neither Nor' other wise leave it.

EXAMPLE

Statement : P > Q ≥ S = R
Conclusion : I. P ≥ R, II. R > Q — Neither nor

Statement : L = T ≤ J ≥ K
Conclusion : I. L > K, II. T ≤ K — Neither nor

Statement : V < L ≥ J ≤ T
Conclusion : I. V < J, II. L = T — Neither nor

Statement : G ≤ K ≤ F < M
Conclusion: I. G > F, II. K ≤ M — Neither nor

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-75-83
Chapter Test	–	C-23-24
Past Solved Papers		

Chapter 13

Problem Solving

INTRODUCTION

In this chapter you will see some typical problems in which you would be given a series of interlinked information and on the basis of those informations you would be expected to reach certain conclusions.

TYPES OF INFORMATIONS IN A GIVEN PROBLEM

1. **Basic Informations**

   (Useful secondary informations): It is given in first couple of sentences of given data are such that they give you some basic information that is essential to give you general idea of the situation.

2. **Actual Informations**

   Whatever remains after the basic informations are known as actual information.

   While trying to solve a problem one should begin with actual information and useful secondary information should be solve by mind.

3. **Negative Informations**

   Actual informations having negative sentences are called negative information. A negative information does not inform us anything exactly but it gives a chance to eliminate a possibility.

TYPES OF PROBLEMS

1. Simple problems (based on categorisation)
2. Problems based on arrangement (Linear, circular, rectangular/ square).
3. Problems based on comparison.
4. Problems based on blood relations.
5. Blood relations and profession based problems.
6. Problems based on conditional selection.

1. SIMPLE PROBLEMS BASED ON CATEGORISATION

Tips to Solve Problems

These type of problems can easily be solved by construction of table.

EXAMPLE 1 Directions : Read the following information carefully and answer the question that follows:

1. There are six cities L, M, N, O, P and Q.
2. L is not a hill station.
3. M and P are not historical places.
4. O is not an industrial city.
5. L and O are not historical cities.
6. L and M are not alike.

Q. Which two cities are industrial centres ?

Sol. It can be solved by preparing a table in the manner given below:

	L	M	N	O	P	Q
Historical place						
Industrial city						
Hill station						

(2), (3), (4), (5) are negative informations. Therefore as per such informations. We put 'X' (not) mark wherever applicable. As a result the table looks like the one below.

	L	M	N	O	P	Q
Historical place	×	×		×	×	
Industrial city				×		
Hill station	×					

As above table gives definite informations about L, O. L is neither a historical place nor a hill station. So, it must be an industrial city. In the same manner O is neither a historical nor an industrial city. So, O must be a hill station. Hence, we put '✓' mark at the appropriate place which give the table following look:-

	L	M	N	O	P	Q
Historical place	×	×		×	×	
Industrial city	✓			×		
Hill station	×			✓		

Now, as per the condition (6) (L and M are not alike), M can not be an Industrial city. Also M is not a historical place either. Therefore, it is very obvious that M is a hill station.

Again, in the given problem there is no negative information about N. Hence, we can assume that N is a hill station as well as a historical place and an industrial city. Combining if these aspects, the following table will be prepared finally.

	L	M	N	O	P	Q
Historical place	×	×	✓	×	×	✓
Industrial city	✓	×	✓	×	✓	✓
Hill station	×	✓	✓	✓	✓	✓

Now, after analysing the given question we get the answer:-
So, P and Q are two industrial centres.

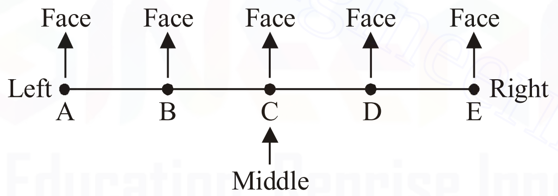
2. PROBLEMS BASED ON ARRANGEMENT

In such problems a group of people, objects, etc, may have to be is arranged in a row, or in a circle or any other way.

Linear Arrangement

onerowsequence

(A) When direction of face is not clear, then we take ourself as base and then the diagram will be as follows

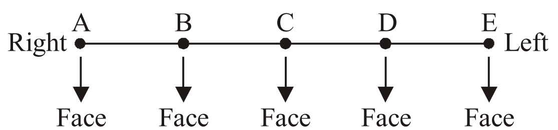


From the above diagram, it is clear that

(i) B, C, D, E are **right** of A but **only** B is the **immediate right** of A.

(ii) D, C, B, A are **left** of E but **only** D is the **immediate left** of E.

(B) When direction of face is towards you, then the diagram will be as follows



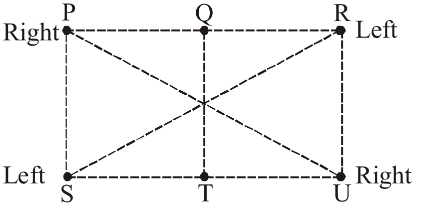
From the above diagram, it is clear that

(i) B is **immediate left** of A, C is **immediate left** of B; D is **immediate left** of C and E is **immediate left** of D.

(ii) D is **immediate right** of E; C is **immediate right** of D; B is **immediate right** of C; and A is **immediate right** of B.

two rows sequence

Let us see 6 persons seating in two rows



From the above diagram, it is clear that

(i) P is sitting **opposite** S.

(ii) Q is sitting **opposite** T.

(iii) R is sitting **opposite** U.

(iv) P and U are sitting at **diagonally opposite** positions.

(v) S and R are sitting **diagonally opposite** positions.

Note: Point to be noted that in arrangement problems, the actual information can be classified into 2 categories:-

(a) Definite information

A definite information is one when the place of object/man is definitely mentioned.

(b) Comparative information

In such information the place of object/man is not mentioned definitely but only a comparative position is given. In other words the positions of objects/men are given in comparision to another objects/men.

❑ ***Shortcut Approach***

Step I. Sketch a diagram of empty places

Step II. Fill up as many empty places as possible using all the definite informations.

Step III. With the help of comparative information consider all possibilities and select the possibilities which does not violate any condition.

EXAMPLE 2. Directions : Just read the following information carefully to answer the questions given below it:

Five friends P, Q, R, S, and T are sitting on a bench.

(1) P is sitting next to Q.

(2) R is sitting next to S.

(3) S is not sitting with T.

(4) T is on the last end of the bench.

(5) R is on the 2nd position from the right.

(6) P is on the right of Q and T.

(7) P and R are sitting together.

Q. All what position is P sitting?

Sol.

Here, 4th and 5th sentences constitute definite information:

Comparative informations are: 1st, 2nd, 6th and 7th sentences while 3rd is a negative information.

Now, start with definite information, sketch the following arrangement:-

T __ __ R __

Now, this is the time to look for the comparative informations that tell about T and R. Such informations are 2nd, 6th and 7th sentences. Take the 7th and the 1st sentence. If P and R are together and also Q and P are together, then P must be between Q and R. Now the arrangement take the form as:-

T Q P R ____

By the virtue of the 2nd sentence:

T Q P R S

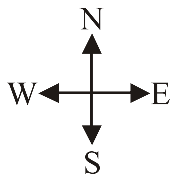
So, P is sitting between Q and R.

Circular Arrangement

Circle is the most important case from the exam point of view. Most of the times Circle kind of statements are there in exams.

From the exam point of view, in most cases they give 8 persons sitting in the circle. But before solving the important thing is their ' Sitting Position '.

Step 1. Knowing NEWS! N= North , E= East , W=West , S= South

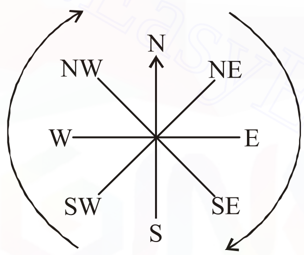


To remember this just remember combination ' North - South ' & ' West - East ' which comes together to each other respectively.

Step 2 : Picking Left & Right .

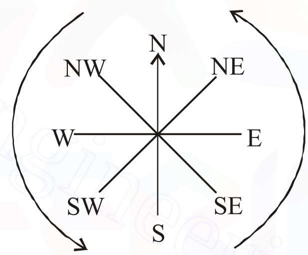
- Facing Center

Clock wise = Left



- Facing Outside

Anti - Clock wise = Right



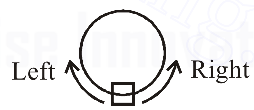
If it is mention in the statement that all is facing outside then just do opposite of above like this:

Clock wise = Right & Anti-clock wise = Left

Step 3 : Solving step wise the statement or Following the statement.

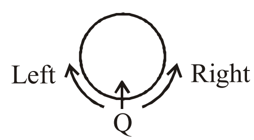
❑ *Shortcut Approach*

- Imagine yourself as one of the persons given in the question.
- Count how many people are mentioned in the question. Then draw a circle with those many lines.

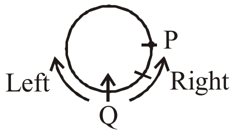


- Imagine yourself at the position shown by the box.
- Now your left hand is the left side and right hand is the right side.
- Now, if in question it is given, P is second to the right of Q, approach as follows.

→ Imagine yourself as Q.



→ Now, P is second to right of Q. The right of Q is your right side. So, place P two places from Q towards its right.

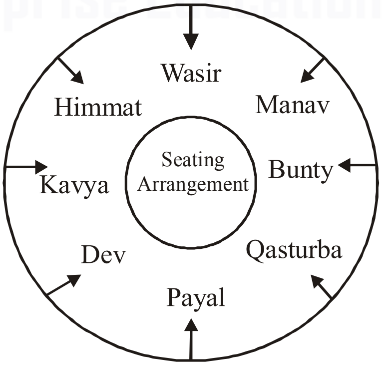


EXAMPLE 3. Directions Study the following information carefully and answer the question given below.

Bunty, Dev, Manav, Kavya, Payal, Qasturba, Wasir and Himmat are sitting around a circle facing at the centre. Manav is to the immediate right of Bunty who is 4th to the right of Kavya. Payal is 2nd to the left of Bunty and is 4th to the right of Wasir. Qasturba is 2nd to the right of Dev who is 2nd to the right of Himmat.

Q. Who is 3rd to the right of Bunty?

Sol.



Now, look at the given question and check that you get the answer.

So, Himmat is 3rd to the right of Bunty.

3. PROBLEMS BASED ON COMPARISON

In such problems comparison of different objects or persons has to be made. Such comparisions are done on the basis of marks, ages heights, etc.

Method to Solve

If you give a serious look to the problem you will find that such problems are as same as the arrangement problems. Therefore, we have to go like arrangement problem while solving problems based on comparison.

EXAMPLE 4. Directions : Read the informations given below to answer the given question:

(1) 7 students A, B, C, D, E, F and G take a series of tests.

(2) No two students obtain the same marks.

(3) G always scores more than A.

(4) A always scores more than B.

(5) Each time either C scores the highest and E gets the least, or alternatively D scores the highest and F or B scores the least.

Q. If D is ranked 6th and B is ranked 5th, which of the following can be true?

Sol.

In this case, we see there is no definite information. Sentence 5 gives a definite information but it is conditional. Still, we draw all the possibilities based on sentence 5.

(1) C __ __ __ __ __ __ E

or, (2) D __ __ __ __ __ __ F

or, (3) D __ __ __ __ __ __ B

We see that the two additional informations (3) and (4) are inadequate to reach a definite conclusion. Hence, keeping these in mind. We move on to the given questions.

D is ranked 6th and B is 5th. This does mean that possibilities (2) and (3) are violated. Hence, possibility (1) must be true. Thus, we have:

C ______ B D E

Also by virtue of (3) and (4) we can have only one arrangement for G, A and B which is GAB. Accordingly, there are two possibilities:

C G F A B D E

or, C G A F B D E

So, if D is ranked 6th and B is ranked 5th, then f is ranked 3rd or 4th.

4. PROBLEMS BASED ON BLOOD RELATION

Such problems involves analysis of certain blood relations.

❑ Shortcut Approach

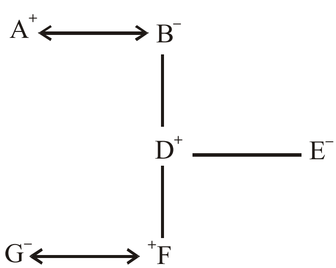
(i) Vertical/diagonal lines to represent parent-child relationships.

(ii) Single/double horizontal line like (↔ / ⇔) to represent marriages.

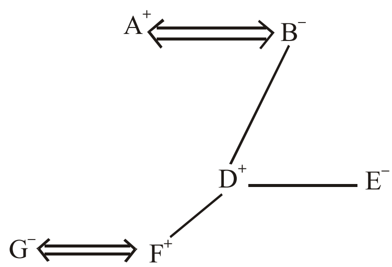
(iii) A dashed line (—) for brother and sister relationship.

(iv) '+' sign for male and '–' sign for female

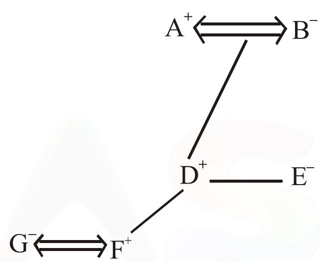
For example.



or



or



The above diagrams tells us:-

(a) A and B are couple; A is the husband while B is the wife.

(b) D is son of A and B while E is daughter of A and B.

(c) D is the brother of E and E is the sister of D.

(d) D has a son F

(e) F and G are couple; F is the husband and G is the wife.

(f) F is the grandson of A and B.

(g) G is the daughter in law of D.

(h) E is the aunt (Bua) of F

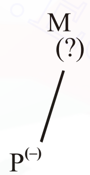
(i) There are 3 males (A, D and F) and 3 females (B, E, G)

EXAMPLE 5. Directions : Read the following information carefully and answer the question given below:

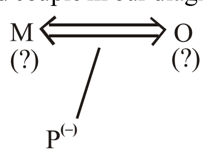
There are 6 members in a family. They are M, N, O, P, Q, R are travelling together. N is the son of O but O is not the mother of N. M and O are a married couple. Q is the brother O. P is the daughter of M. R is the brother of N.

Q. How many male members are there in the family?

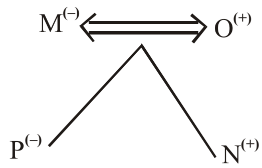
Sol. Here, all the sentences are actual information except the first out of these the 2nd and the fifth sentences give information on parent child relationship. We can begin with either of the two. Let us begin with the 6th sentence. Our diagram will be as



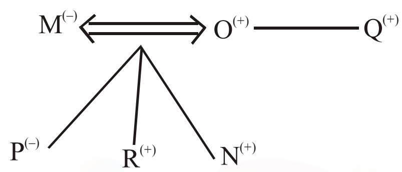
As, we do not want to make many diagrams and instead we would prefer to only add to the existing diagsams. Therefore, we should look for sentences that talk of M or P. The 3rd sentence talks about M. Hence, we add this information, that M and O are married couple in our diagram.



Now, the 2nd sentence talks about O. It says that N is the son of O but O is not the mother of N. Obviously, O must be the father of N. This means O is a male and hence M must be a female. Now our diagram takes the form as following:-



Now, we add the two sentences 'Q is the brother of O' and 'R is the brother of N' and we get the final diagram as below:-



So, there are 4 male members in the family.

5. PROBLEMS BASED ON BLOOD RELATIONS AND PROFESSION

Such problems are very much similar to the problems related to blood relation. What makes it different is the addition of new data:- the professions of family members. You will get the more clear idea about this type of problem.

EXAMPLE 6. Directions : Read the following information carefully and answer the question given below it:

(1) A, B, C, D, E and P are members of a family.

(2) There are two married couples.

(3) B is an engineer and the father of E

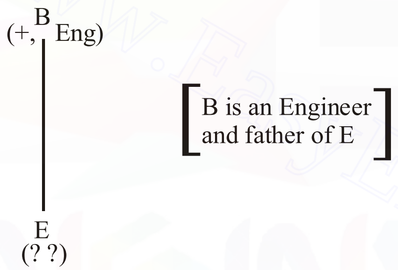
(4) P is the grandfather of C and is a lawyer.

(5) D is the grandmother of E and is a housewife.

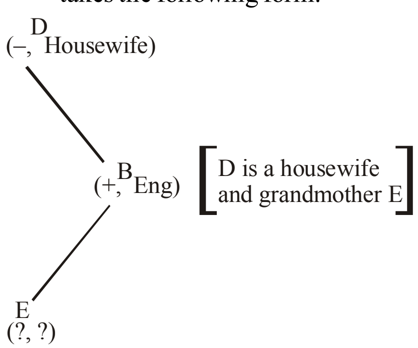
(6) There is one engineer, one lawyer, one teacher, one housewife and two students in the family.

Q. Who is the husband of A?

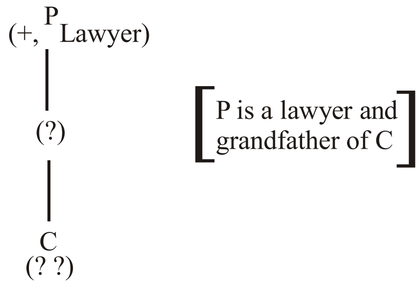
Sol. Here, (1), (2), and (6) are useful secondary informations. While (3), (4) and (5) are the actual informations. We start with the 3rd sentence because it mentions a parent. Child relationship its diagram can be made as the following:-



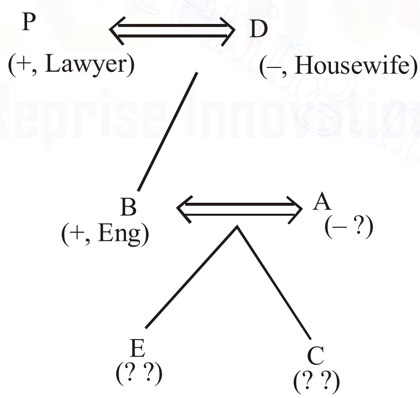
Now, we move on to another sentence that involves either B or E. You see that the 5th sentence gives some information about E. It says that D is the grandmother E. Point to be noted that if D is the grandmother of E, then the son of D must be father of E and hence B is the son of D. Now, the diagram takes the following form.



Now, the 4th sentence has the remaining information and diagram for it is given below:-



Now, we see that we have ended up with two different component. Then how to resolve this deadlock? The answer is simple: - to resolve it, we make use of the given useful secondary information (USI). "There are two married couple in the family." Clearly, the two possible pairs are of grandfather, grandmother and father, mother. Therefore, we combine the two diagrams into the following way.



Point to be noted that the professions of A, E and C are yet unknown. However, with reasonable justification, we may assume that the mother (A) should be the teacher and the two children

E and C should be students. But this conclusion can be challenged and has no reason at all.

Apart from that the sexes of E and C can not be determined. So, B is husband of A.

6. PROBLEMS BASED ON CONDITIONAL SELECTION

In this type of problems, a group of objects/persons has to be selected from a given larger group, as per the given restrictions. You will get the better idea of such type of problem from the problem given below:-

EXAMPLE **7. Directions : Study the following information carefully and answer the question given below:-**

From, amongst 6 boys J, K, L, M, N, and O and 5 girls P, Q, R, S and T, a team of 6 is to be selected under the following conditions:-

(i) J and M have to be together.
(ii) L can not go with S.
(iii) S and T have to be together.
(iv) K can not be teamed with N.
(v) M cannot go with P.
(vi) K and R have to be together.
(vii) L and Q have to be together.

Q. If there be 5 boys in the team, then the lone girl member is ------

Sol. Make the group of all the pairs that have to be together on one side and the pairs that must not be together on the other side. Next, read each of the questions and treat that as an additional information. Finally, analyse the possibilities and choose the possibilities that satisfies all the conditions. Let us see the process below:-

Firstly, we can summarise the conditions in the following way:-

J, M	S, T
(+)(+)	(–)(–)
K, R	L, Q
(+)(–)	(+)(–)

→ Group 'must be together'.

L, S,	K, N,	M, P
(+)(–)	(+)(+)	(+)(–1)

→ Group never be together'

Here, number of boys are 5. We see than K and N can never be together. Therefore, there are only two ways of selecting 5 boys:- JKLMO and JNLMO. But the possiblity is not possible because if K would go then R should also go, and if L goes than Q should also go. Hence, JNLMO is the only possibility in which L's friend Q would be the lone girl member.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-84-96
Chapter Test	–	C-25-26
Past Solved Papers		

Chapter 14

Input and Output

INTRODUCTION

Problems related to input-output are frequently asked questions in various graduate level competitive examinations. They are not very tough stuff but take a good deal of time to be solved or sometimes students do not take attempt to solve them because of time consuming impression of such type of questions. But proper understanding of the subject makes you believe that such problems are not as tough and time consuming as they seem.

CONCEPT OF INPUT-OUTPUT PROBLEMS

In such problems:

(a) It is imagined that there is some kind of computer/word processing machine.

(b) An input is given to the computer/word processing machine

(c) The computer/word processing machine performs repeated operations as per a certain pattern to give different output in different steps.

TYPES OF PROBLEMS

(i) Problems of shifting

(ii) Problems of arrangement

(iii) Problems of mathematical operation

(iv) Miscellaneous.

PROBLEM OF SHIFTING

We know that in such type of problems, a word/number processing machine generate output through shifting. Shifting does mean an operation in which words or numbers of a given input give outputs in different steps through shifting their place to different place as per a fixed pattern.

Note : In shifting problems, the previous step of any step can possibly be determined, so we can move in backward or reverse order which is not possible in some of the other type of problems.

Methods to Solve

Lets take an example

Input : Blue Cat Good Other Have Cake

Step 1 : Blue Other Good Cat Have Cake

Step 2 : Blue Other Have Cat Good Cake

Step 3 : Cake Other Have Cat Good Blue

Step 4 : Cake Cat Have Other Good Blue

Step 5 : Cake Cat Good Other Have Blue

Step 6 : Blue Cat Good Other Have Cake

Shifting of element can easily be understood by making them equivalent to number like

Blue = 1, Cat = 2, Good = 3, Other = 4, Have = 5, Cake = 6

Input can be written as

1	2	3	4	5	6
Blue	Cat	Good	Other	Have	Cake

Step-1 : 2 and 4 interchanged

Step-2 : 3 and 5 interchanged

Step-3 : 1 and 6 interchanged

Step-4 : 1, 2 and 3 are repeated again.

Input :	1	2	3	4	5	6	Step-3 :	6	4	5	2	3	1
Step-1 :	1	4	3	2	5	6	Step-4 :	6	2	5	4	3	1
Step-2 :	1	4	3	2	5	6	Step-5 :	6	2	3	4	5	1
							Step-6 :	1	2	3	4	5	6

PROBLEMS ON ARRANGEMENTS

1. Word Arrangement from Left Side:

EXAMPLE :

Input :	mango	tango	orange	banana	pear
Step I:	banana	mango	tango	orange	pear
Step II:	banana	mango	orange	tango	pear
Step III:	banana	mango	orange	pear	tango

Here, we start arrangement from the word that comes 1st in the dictionary; then comes the word coming 2nd in the dictionary, then comes the word coming 3rd in the dictionary and so on. In this case, the arrangement start from left side. This is the reason in step I banana comes 1st as it comes 1st in the dictionary. In the 2nd step, orange comes at 3rd place because after the arrangement of step I the next word coming in the dictionary is mango but it get arranged automatically and hence there is no need to arrange it in step II. This is the reason after arranging banana in step I, we directly come to the word orange (coming 3rd in the dictionary) in step II. In the 3rd step, we arrange the word 'pear' (coming 4th in the dictionary) and the word tango get arranged automatically.

2. Word Arrangement from Right:

EXAMPLE :

Input:	Name	Fame	Game	Shame	Jam
Step I:	Name	Game	Shame	Jam	Fame
Step II:	Name	Shame	Jame	Game	Fame
Step III:	Shame	Name	Jam	Game	Fame

In this case, the arrangement starts from right side. The word coming 1st in the dictionary comes at the 1st position from right. At the 2nd position from right comes the word coming 2nd in the dictionary and the process goes on till the arrangement gets completed. In the above given example, 'Fame' is the 1st word coming in the dictionary and hence it comes at the 1st position from right in the step I. In the step II, the 2nd word coming in the dictionary (Game) comes at the 2nd position from right. Point to be noted that the word coming

third in the dictionary will come at the 3rd position from right and this word is 'Jam'. But 'Jam' automatically get arranged as per the given pattern when we arrange the word 'Game' in II step. This is the reason why we don't arrange 'Jam' in the third step and jump directly to arrange the word. 'Name' that comes 4th in the dictionary. 'Name' occupies 4th position from right and the word 'Shame' automatically get arranged in the 3rd step. Hence, the word 'Shame' does not need to get arranged.

3. Word Arrangement from the Left-Right Alternate:

EXAMPLE :

Input:	Sachin	is	a	great	cricket	player
Step I:	a	Sachin	is	great	cricket	player
Step II:	a	is	great	cricket	player	Sachin
Step III:	a	cricket	is	great	player	Sachin
Step IV:	a	cricket	great	is	player	Sachin

Here, the arrangement is made by putting the first word at 1st place, then alphabetically last word at last place, then alphabetically second word at second place from left and the further arrangements goes on in the same manner. In the other words, are positioned from the left and from the right alternately. In the step I the word coming 1st in the dictionary is 'a' and it takes 1st position from left. In the step II, the last word coming alphabetically is Sachin and it takes last position (1st from right). In step III, the word coming 2nd in dictionary is 'cricket' that comes at 2nd position from left. In step IV, the word coming 3rd last in the dictionary takes the 3rd position from right. After the step IV, all the words get arranged in alphabetical order. Point to be noted that after step IV, there is no need to arrange the word 'great' as it get arranged automatically is step IV.

4. Arrangement in Increasing or Decreasing Order:

EXAMPLE :

Input:	25	17	18	58	100	35
Step I:	17	25	18	58	100	35
Step II:	17	18	25	58	100	35
Step III:	17	18	25	35	58	100

This arrangement gives a clear idea of arrangement of numbers in increasing order. In step I, the smallest number (17) comes at the 1st position from left pushing the remaining to the right. In step II, the 2nd smallest number (18) comes at 2nd position from left pushing the remaining number to the right. In step III, the 4th smallest number (35) takes 4th position from left and the other two numbers 58 and 100 get arranged automatically.

Now, let us see decreasing order arrangement:

Input:	25	17	18	58	100	35
Step I:	100	25	17	18	58	35
Step II:	100	58	25	17	18	35
Step III:	100	58	35	25	17	18
Step IV:	100	58	35	25	18	17

The same arrangement can take place from right side (or in the reverse order) as follow:

Input:	25	17	18	58	100	35
Step I:	25	18	58	100	35	17
Step II:	25	58	100	35	18	17
Step III:	58	100	35	25	18	17
Step IV:	100	58	35	25	18	17

5. Number Arrangment from Left-Right Alternate:

Like words left-right alternate arrangement, number arrangement also takes place. The process of this arrangement is exactly the same as the arrangement takes place in case of words. Just see the following cases:

Case I :

Input:	100	125	26	10	15	35
Step I:	10	100	125	26	15	35
Step II:	10	100	26	15	35	125
Step III:	10	15	100	26	35	125
Step IV:	10	15	26	35	100	125

Here, the smallest number (10) takes 1st position from left in step I. In step II the largest number takes the last (1st from right) position. Again in step III the 2nd smallest number (15) comes at the 2nd position from left. In the step IV, the 2nd largest number (100) comes at the 2nd position from right and the remaining number (26 and 35) get arranged automatically.

Case II :

Input:	100	125	26	10	15	35
Step I:	100	26	10	15	35	125
Step II:	10	100	26	15	35	125
Step III:	10	26	15	35	100	125
Step IV:	10	15	26	35	100	125

In case II, the arrangements take place in the same way as the arrangements take place in case I. But the difference here is that case I is a left-right

arrangement and case II is the right-left arrangement. In case II, the arrangement starts with the largest number (125) coming at the 1st position from right and this is step I. In step II, the smallest number (10) comes at the 1st position from left. In step III the 2nd largest number (100) comes at the 2nd position from right. In step III, the third largest number (35) automatically comes at the 3rd position from right. In 4th step, the 2nd smallest number (15) comes at the 2nd position from left and 26 get arranged automatically coming at 3rd position from left.

Note: Left-right (or right-left) arrangement of numbers also take place in the same manner when numbers are arranged in decreasing order.

6. Arrangement of Words and Numbers Simultaneously:

Just see the following outputs produced by a word and number machine.

Case I

Input:	50	32	Vandana	Prerna	Aradhna	100
Step I:	32	50	Vandana	Prerna	Aradhna	100
Step II:	32	Aradhna	50	Vandana	Prerna	100
Step III:	32	Aradhna	50	Prerna	Vandana	100
Step IV:	32	Aradhna	50	Prerna	100	Vandana

In such case, numbers and words get arranged alternately. In step I, the smallest number (32) comes at the 1st position from left pushing the remaining members of input towards right. In the step II, the word coming 1st alphabetically (that is the word 'Aradhna') takes the 2nd position from left pushing the remaining member rightward. Point to be noted that the 2nd smallest number automatically comes at the third position from left while arranging the word 'Aradhna' and hence, there is no need to arrange the 2nd smallest number '50'. In step III, the word (Prerna) coming 2nd alphabetically comes at the 4th position from left pushing the other members to the right. In step IV, the largest number (100) occupies the 5th position from left and the word (Vandana) coming last alphabetically comes at last position automatically finishing the complete arrangement.

Let us see some other cases of this type:

Case II:

Input:	50	32	Vandana	Prerna	Aradhna	100
Step I:	100	50	32	Vandana	Prerna	Aradhna
Step II:	100	Vandana	50	32	Prerna	Aradhna
Step III:	100	Vandana	50	Prerna	32	Aradhan

In this case, largest number and the word coming last alphabetically get arranged alternately. Then the 2nd longest number and the word coming 2nd last alphabetically get arranged alternately and the process goes on till the arrangements of all the numbers and words get completed. In this case, arrangement completes in step III.

Case III:

Input:	50	32	Vandana	Prerna	Aradhna	100
Step I:	Aradhna	50	32	Vandana	Prerna	100
Step II:	Aradhna	32	50	Vandana	Prerna	100
Step III:	Aradhna	32	Prerna	50	Vandana	100

In this case, arrangement starts with the word coming 1st alphabetically and such word is 'Aradhna' that comes at the 1st position from left is step I. In step II, the smallest number (32) comes at the 2nd position from left. Then, in step III, the word coming 2nd alphabetically comes at the 3rd position from left and all the other members get arranged automatically.

Case IV:

Input:	50	32	Vandana	Prerna	Aradhna	100
Step I:	Vandana	50	32	Prerna	Aradhna	100
Step II:	Vandana	100	50	32	Prerna	Aradhna
Step III:	Vandana	100	Prerna	50	32	Aradhna
Step IV:	Vandana	100	Prerna	50	Aradhna	32

In this case, word coming last alphabetically comes 1st from left in step I and such word is 'Vandana'. In step II, the largest number (100) comes at the 2nd position from left. In step III, the word coming 2nd last alphabetically occupies the 3rd position from left, and such word is 'Prerna'. As the 2nd largest number (50) automatically get arranged as per the pattern going on and hence this is not needed to arranged in step IV. In step VI, the word coming Ist alphabetically comes at the 5th position from left and such word is 'Aradhna'. The smallest number (32) get arranged automatically coming at the last position from left in step IV. Thus, it is clear that in this case the word coming lst alphabetically and the greatest number get arranged alternately in 1st two steps; then 2nd last word alphabetically and 2nd largest number get arranged alternately finishing the whole arrangement in step IV.

Case V:

Input:	50	32	Vandana	Prerna	Aradhna	100
Step I:	32	50	Vandana	Prerna	Aradhna	100
Step II:	32	Vandana	50	Prerna	Aradhna	100
Step III:	32	Vandana	50	Prerna	100	Aradhna

In this case, the smallest number comes at the 1st position from left in step I and such number is 32. In step II, the word (Vandana) coming last alphabetically occupies the 2nd place from left. In the 2nd step, the 2nd smallest number (50) takes the 3rd position from left automatically and also the word coming 2nd last alphabetically takes the 4th position from left automatically. Hence, there is no need to arrange '50' and 'Prerna'. In the III step, the largest number (100) occupies the 5th position from left completing the whole arrangement.

Case VI:

Input:	50	32	Vandana	Prerna	Aradhna	100
Step I:	100	50	32	Vandana	Prerna	Aradhna
Step II:	100	Aradhna	50	32	Vandana	Prerna
Step III:	100	Aradhna	50	Prerna	32	Vandana

In this case, the logic is that the greatest number (100) comes at the 1st position from left in step I. In step II the word coming 1st alphabetically takes the 2nd position from left and the 2nd largest number (50) gets arranged automatically. Hence, in step III, we direct arrange the word coming 2nd last alphabetically (that word is 'Prerna') occupies the 4th position from left and the other two members (32 and 'Vandana') get arranged automatically finishing the whole arrangement.

7. Arrangement Based on the Number of Letters in Words:

Just have a look at the following patterns:

Case I :

Input:	let	pattern	love	fried	be	mature
Step I:	be	let	pattern	love	fried	mature
Step II:	be	let	love	pattern	fried	mature
Step III:	be	let	love	fried	pattern	mature
Step IV:	be	let	love	fried	mature	pattern

Here, the words get arranged as per increasing number of letters. In other words, the word having least number of letters comes 1st from left in step I and such word is 'be'. The word 'let' is bigger than 'be' and smaller than other words letterwise and hence, it takes 2nd position from left but it gets arranged automatically when the word 'be' is arranged in step I. In 2nd step, the word 'love' comes at the 3rd position from left as it is bigger than word 'let' letterwise. In step III, the letterwise bigger word (fried) than love comes at the fourth position from left. Similarly, mature comes at the 5th position from left and pattern comes at the last position automatically while arranging the word 'mature'.

Case II :

Input:	let	pattern	love	fried	be	mature
Step I:	pattern	let	love	fried	be	mature
Step II:	pattern	mature	let	love	fried	be
Step III:	pattern	mature	fried	let	love	be
Step IV:	pattern	mature	fried	love	let	be

In this case, the words get arranged in decreasing order in terms of letters. In other words, the word having the largest number of letters comes 1st from left, then comes the word having 2nd largest number of letters, then comes the word having 3rd largest number of letters and the process goes on till the word having the least number of letters occupies the last position from left.

Case III:

Input:	let	pattern	gate	a	set	be	hope
Step I:	a	let	pattern	gate	set	be	hope
Step II:	a	be	let	pattern	gate	set	hope
Step III:	a	be	let	set	pattern	gate	hope
Step IV:	a	be	let	set	gate	pattern	hope
Step V:	a	be	let	set	gate	hope	pattern

Have you noticed something here? Here, the words get arranged in increasing order of litters. But when it comes to the case of two or more words having equal number of letters the priority is given alphabetically. It does mean that the word coming 1st as per the alphabet will be put before the word coming 2nd. Similarly, the word coming 2nd alphabetically will be put before the word coming third. This is the reason why 'let' has been put before 'set' and 'gate' has been put before 'hope'.

Case IV:

Input:	let	pattern	gate	a	set	be	hope
Step I:	pattern	let	gate	a	set	be	hope
Step II:	pattern	hope	let	gate	a	set	be
Step III:	pattern	hope	gate	let	a	set	be
Step IV:	pattern	hope	gate	set	let	a	be
Step V:	pattern	hope	gate	set	let	be	a

In this case, the words get arranged in decreasing order of letters. But when it comes to the case of two or more words having equal number of letters the priority is given to the word that comes later alphabetically. It does mean that the word coming 1st alphabetically will be put after the word coming 2nd and the word coming 2nd will be put after the word coming 3rd. This is the reason why 'hope' has been put before 'gate' and 'set' has been put before 'let'.

Important Note: *The case of arrangement discussed so far are the cases of push. In all the cases a new word jumps from its place in every step, occupies its new and due place and gives the remaining words and push either towards left or right as per the requirement of the pattern. But in some cases of arrangement interchange does take place and that format is given below*:

8. Arrangement with Interchange:

EXAMPLE

Input:	the	most	beautiful	girl	is	Vandana
Step I:	beautiful	most	the	girl	is	Vandana
Step II:	beautiful	girl	the	most	is	Vandana
Step III:	beautiful	girl	is	most	the	Vandana

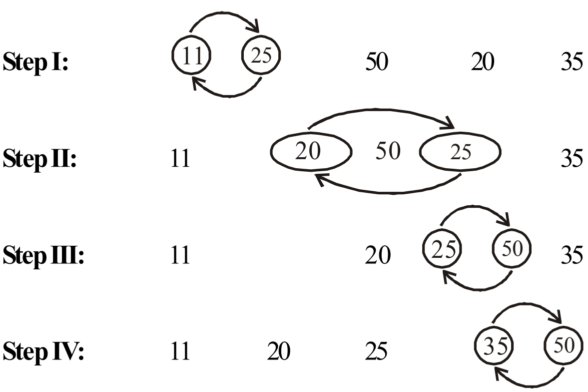
In this case, the word (beautiful) coming 1st in alphabetical order comes at the 1st position from left interchanging its place with the word 'the' and this is step I. In step II, the word (girl) coming 2nd in alphabetical order occupies the 2nd position from left interchanging with the word 'most'. In step III, the word coming 3rd (is) comes at the third position from left interchanging with the word 'the' and finishing the complete arrangement in alphabetical order.

This type of cases can also be seen in number arrangements and in the arrangements of numbers and words simultaneously. The examples of these type of arrangements are given below:

EXAMPLE **(Increasing order number arrangement)**

Input:	25	11	50	20	35
Step I:	11	25	50	20	35
Step II:	11	20	50	25	35
Step III:	11	20	25	50	35
Step IV:	11	20	25	35	50

Presentation :



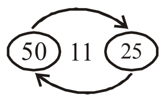
The presentation gives you the clear idea of how interchange takes place in every step.

EXAMPLE **(Decreasing order number arrangement)**

Input:	25	11	50	20	35
Step I:	50	11	25	20	35
Step II:	50	35	25	20	11

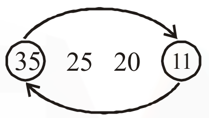
Presentation:

Step I:



20 35

Step II: 50



PROBLEMS OF MATHEMATICAL OPERATION—

In this type of problems, the input has some numbers. Different steps are obtained by taking the numbers of the input and different arithmetic operations are performed after that.

EXAMPLE

Input :	44	35	18	67	22	28	36
Step I :	36	27	10	59	14	20	28
Step II :	16	15	8	42	4	16	18
Step III :	132	105	54	201	66	84	108
Step IV :	50	41	24	73	28	34	42
Step V :	8	8	9	4	4	1	9
Step VI :	64	64	81	169	16	100	81
Step VII :	20	19	12	46	8	20	22

In this case, in step I (each number of the input – 8). In step II, product of the digits of each number of the input. In step III, each number of the input is multiplied by 3. In step IV, each number of the input is added by 6. In step V, keep adding the digits of each number of the input till they are converted into single digit. In step VI, (digit sum of each number of input)^2. In step VII, each number of step II is added by 4.

MISCELLANEOUS PROBLEMS

In this type of problems, there is no fixed pattern of questions coming under this category. Infact, questions under this category comes before you as a real surprise.

EXAMPLE

Input :	every	now	and	then	same
Step I :	every	ow	nd	hen	ame
Step II :	ever	no	an	the	sam
Step III :	vry	nw	nd	thn	sm
Step IV :	ee	o	a	e	ae
Step V :	ery	w	d	en	me

In this case, in step I, first letter disappear. In step II, last letter disappear. In step III, vowels disappear. In step IV, consonants disappear. In step V, first two letters disappear.

❑ Shortcut Approach

1. First of all, observe the given input line of words or numbers and the last step of rearrangement, so that candidate may get an idea about the changes effected in various steps of rearrangement.
2. In order to know what changes have been made in each step, observe two consecutive steps carefully.
3. Now, correlate the input, the last step and anyone of the middle steps. This will enable you to identify the rule of arrangement.
4. In shifting problems, it is possible to determine the previous/earlier steps including input. We can proceed/move backward or in reverse direction in shifting problems.
5. In shifting problems for convenience, we assign numeric value to given words.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-97-105
Chapter Test	–	C-27-28
Past Solved Papers		

Chapter 15

Syllogism

INTRODUCTION

Syllogism is a Greek word that does mean 'inference' or 'deduction'. The problems of syllogism are based on two parts :

1. Proposition / Propositions
2. Conclusion / Conclusions drawn from given proposition/ propositions

PROPOSITION

Just consider the sentences given below:

(i) "All lions are pigs"
lions → Subject; pigs → Predicate

(ii) "No cat is rat"
cat → Subject; rat → Predicate

(iii) "Some girls are beautiful"
girls → Subject; beautiful → Predicate

(iv) "Some kites are not birds"
kites → Subject; birds → Predicate

All the sentences mentioned above give a relation between subject and predicate. Here, it is clear from the sentences that a subject is the part of a sentence something is said about, while a predicate is the term in a sentence which is related to the subject.

Now, let us define the proposition :

A proposition is a sentence that makes a statement giving a relation between two terms. It has three parts :

(a) The subject
(b) The predicate
(c) The relation between subject and predicate

CATEGORICAL PROPOSITION

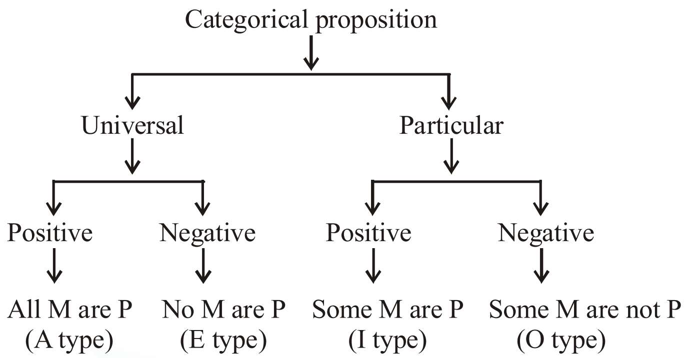
Let us see the sentences given below :

"All M are P"
"No M are P"
"Some M are P"
"Some M are not P"

What we notice in all above-Mentioned sentences that they are **condition free**. These type of sentences are called **Categorical Propositions**. In other words a categorical proposition has no condition attached with it and it makes direct assertion. It is different from non-categorical proposition which is in the format

"If M then P"

TYPES OF CATEGORICAL PROPOSITION:



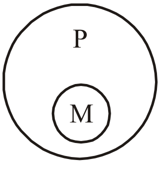
Therefore, it is clear, that universal propositions either completely include the subject (A type) or completely exclude it (E type). On the other hand, particular propositions either only partly include the subject (I type) or only partly exclude the subject (O type).

Now, we can summarise the four types of propositions to be used while solving the problems of syllogism :

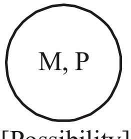
Format	**Type**
All M are P	A
No M are P	E
Some M are P	I
Some M are not P	O

❑ *Shortcut Approach*

All M are P (A type):

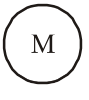


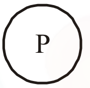
and



[Possibility]

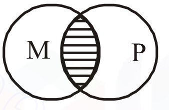
No M are P (E type):





Some M are P (I type):

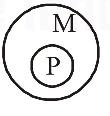
Either:



Some M are P

[Some M are not P]

Or :

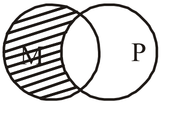


Some M are P

[All P are M]

Some M are not P (O type):

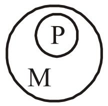
Either:



Some M are not P

[Some M are P]

Or:



Some M are not P
[All P are M]

HIDDEN PROPOSITIONS

(A) A type:

Apart from 'all' it starts with every, each and any.

EXAMPLE

Every girl is beautiful.
[All girls are beautiful.]

(i) A positive sentence with a particular person as its subject is A type.

He should be amended Bharat Ratna
He → Subject; Bharat Ratna → Predicate

Amitabh Bacchan is a great actor.
Amitabh Bacchan → Subject; great → Predicate

(ii) A sentence in with a definite exception is A type :

"All girls except Reeta are healthy."
Reeta ↑ definite exception

(B) E type:

Apart from 'no' this type of propositions starts from 'no one', 'none', 'not a single' etc.

EXAMPLE

No one (student) is studious.
[No student is studious]

(i) A negative sentence with a particular person as its subject is E type propoistion.

He does not deserve Bharat Ratna
He → Subject; Bharat Ratna → Predicate

Amitabh Bacchan is not a great actor.
Amitabh Bacchan → Subject; great → Predicate

(ii) Sentences in following formats are E type :

"No student except Reena has failed"
Reena ↑ definite exception

"Is there any truth left in the world"
[No truth is left in the world.]

(C) I type:

Apart from some it also starts with words such as often, frequently, almost, generally, mostly, a few, most etc.

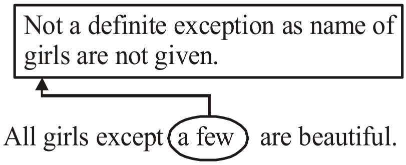
EXAMPLE

(i) Almost all the girls are beautiful.
[Some girls are beautiful].

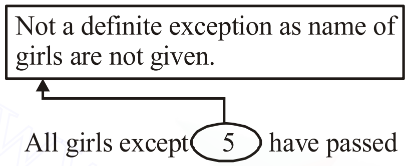
(ii) Most of the garments are handmade.
[Some of the garments are handmade].

It is clear from the above examples that negative sentences begining with words like 'few', 'rarely', 'seldom', etc. (Also 'hardly', 'scarcely', 'little' etc.) are to be reduced to I type.

Just see the other formates given below



[Some girls are beautiful]



[Some girls have passed]

Therefore, a positive proposition with an indefinite exception is reduced to I type.

(D) O type :

Apart from "Some .... not' this type of statements start with words like 'all', 'every', 'any', 'each', etc.

EXAMPLE

(i) All girls are not beautiful.
[Some girls are not beautiful]

(ii) Poor are usually not healthy.
[Some poor are not healthy]

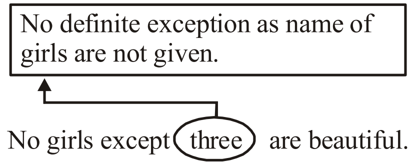
Now, it is clear from the above mentioned examples that negative propositions with words such as 'almost', 'frequently', 'most', 'mostly', 'a few', generally, etc. are to be reduced to the O–type propositions.

Again, positive propositions starting with words like 'few', 'scarcely', 'rarely', 'little', 'seldom' etc. are said to be O–type.

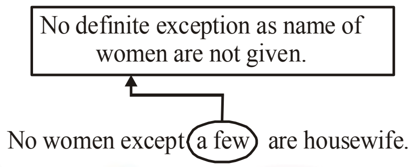
EXAMPLE

Seldom are women jealous.
[Some women are not jealous]

Also, see the following formates :



[Some girls are not beautiful.]



Therefore, a negative proposition with an indefinite exception, is reduced to O type.

EXCLUSIVE PROPOSITIONS

Such propositions start with 'only', 'alone', 'none else but', 'none but' etc. and they can be reduced to either A or E or I format.

EXAMPLE

Only graduates are Probationary Officers.

⇒ No graduate is Probationary Officer (E type)

⇒ All Probationary Officers are graduates. (A type)

⇒ Some graduates are Probationary Officers (I type)

General format of sentences given in the examinations :

All M are P	(A type)
No M are P	(E type)
Some M are P	(I type)
Some M are not P	(O type)

Note : General format given above are frequently asked formats in the examinations. But students must be ready for other hidden formates of A, E, I and O types of propositions as problems in hidden formates can also be given in question papers.

CONVERSION OF PROPOSITIONS

Before solving the problems of syllogism it is must to know the conversion rules of all A, E, O, and I types of propositions :

(i) Conversion of A type :

Subject ↑ Predicate ↑

"All (M) are (P)" (A type)

After conversion it becomes.

Subject ↑ Predicate ↑

"Some (P) are (M)" (I type)

Therefore, it is clear that A type of propositions get converted into I type.

(ii) Conversion of E type :

Subject ↑ Predicate ↑

"No (M) are (P)" (E type)

After conversion it becomes

Subject ↑ Predicate ↑

"No (P) are (M)" (E type)

Therefore, E gets converted into E.

(iii) Conversion of I type :

Subject ↑ Predicate ↑

"Some (M) are (P)" (I type)

After conversion it becomes

Subject ↑ Predicate ↑

"Some (P) are (M)" (I type)

Therefore, I gets converted into I.

(iv) Conversion of O type :

O type of proposition can't be converted.

Note : In each conversion, subject becomes predicate and predicate becomes subject.
In fact, conversion is an immediate inference that is drawn from a single proposition while inference drawn from two propositions are called mediate inference.

❑ Shortcut Approach

Table of conversion :

Type of proposition	Get converted into
A	I
E	E
I	I
O	Never get converted

Rule to draw conclusion :

After knowing conversion of propositions, we must learn the rules to draw conclusions. In problems of syllogism, conclusions are drawn either from single propositions or from two proposition or from both. But a conclusion from single proposition is just a conversion of that proposition while to get conclusion from two propositions a certain table is used that tells us what type of conclusion (in form of proposition) we get out of two propositions. To understand it, let us see the following conclusion table :

Conclusion Table

I Proposition	II Proposition	Conclusion
A	A	A
A	E	E
E	A	$(O)^R$
E	I	$(O)^R$
I	A	I
I	E	O

Note :

(a) Apart from above 6 pairs of propositions, no other pair will give any conclusion.

(b) The conclusion drawn out of two propositions is itself a proposition and its subject is the subject of the Ist statement while its predicate is the predicate of the 2nd statement. The common term get disappeared.

(c) $(O)^R$ does mean that the conclusion is O type but is in reverse order. In this case, the subject of the inference or conclusion is the predicate of the 2nd proposition and the predicate of the conclusion is the subject of the Ist sentence or statement.

(d) The conclusion table gives correct conclusions or inference if and only if the two propositions are aligned properly.

WHAT IS ALIGNING ?

Let us see the following examples :

EXAMPLE

Statements :

I. All (girls) are beautiful.

II. Some (girls) are Indian.

EXAMPLE

Statements :

I. No (pen) is chair.

II. Some tables are (pen).

EXAMPLE

Statements :

I. Some women are (men).

II. No (men) is chair.

In all the above mentioned example, we notice that in two statements of every example, there is a common term. In example 1 the word 'girl' is common; in example 2 the word 'pen' is common while in example 3 the word 'men' is common.

Now, the aligning of the two statements (propositions) does mean that the pair of statements must be written in such a way that the common term is the predicate of the 1st sentence and the subject of the 2nd.

Just think over the following examples :

Statements :

I. Some girls are (cute).

II. All (cute) are tall.

Here, the common term cute is the predicate of the I statement and subject of the 2nd statement. Therefore, the two statements (I & II) are properly aligned. But see another example.

Statements :

I. Some (bats) are chairs.

II. Some cats are (bats).

Here, the sentences are not aligned as the predicate of the 1st statement is not the subject of the 2nd.

Then how to align it ? In such type of cases we change the order of sentences. In another words we put I sentence in place of II and II in place of I :

II. Some cats are (bats).

I. Some (bats) are chairs.

Therefore, as per the requirement and nature of the sentence the alignment is done.

(i) only by changing the order of sentences.

or

(ii) only by converting of the sentences.

or

(iii) By changing the order of the statements and then converting one of the sentences.

IEA Rule

Alignment must be done in IEA order. It does mean that if the two statements are I & E then the conversion must be done for I and for E & I it will be done for E.

After discussing all the minute things about this chapter, now we have come at the position of solving the problems of syllogism.

METHODS:
(1) By Analytical Method
(2) By Venn Diagram

(1) **Analytical method :**

This method has two main steps:

(a) Aligning the pair of sentences.

(b) Using conclusion table to draw conclusion.

EXAMPLE **Statements :**

I. All rats are cats.

II. All rats are men.

When aligned it takes the form as

I. Some cats are (rats) [I type]

II. All (rats) are men [A type]

Now we use the conclusion table given in this chapter that says

I + A = I type of conclusion.

Therefore, the drawn conclusion must be

"Some cats are men"

It is clear that the conclusion drawn "Some cats are men" is a mediate inference as it is the result of two propositions. But in actual problem immediate inferences are also given in conclusion part and that format is given below :

EXAMPLE **: Statements:**

I. All rats are cats.

II. All rats are men.

Conclusion:

(i) Some cats are men.

(ii) Some men are cats.

(iii) Some rats are cats.

(iv) Some cats are rats.

(v) Some rats are men.

(vi) Some men are rats.

Here, all the options are correct. **conclusion** (i) follows because it is the mediate inference of statements I & II.

Conclusion (ii) is the conversion of conclusion (i) conclusion (iii) is the immediate inference (conversion) of statement I while conclusion (iv) is the conversion of conclusion (iii).

Conclusion (v) is the immediate inference (conversion) of statement II while conclusion (vi) is the conversion of conclusion (v).

Further, in some problems complementary pairs are also seen in th e conclusion part in the forms of sentence given below:

(a) (i) Some cats are rats.
(ii) Some cats are not rats] I - O pair

(b) (i) All cats are rats.
(ii) Some cats are not rats.] A - O pair

(c) (i) Some cats are rats.
(ii) No cats are rats.] I- E pair

Apart from I - O, A - O and I - E pair the two sentences must have some subject and predicates as are the above mentioned pairs. for these pairs we write the form 'Either (i) or (ii) follows.

METHOD TO SOLVE

(a) First step is aligning the sentences.
(b) Second step is using conclusion table.
(c) Third step is checking immediate inferences.
(d) Fourth step is checking through the conversion of immediate inferences & immediate inferences.
(e) First step is checking the complementary pairs.

(2) **Venn diagram method for solving problems :**
Students will have to adopt three steps to solve the syllogism problems through Venn diagram method :

METHOD TO SOLVE

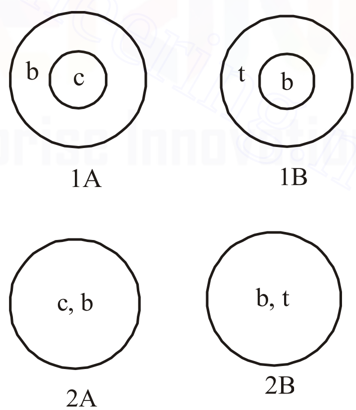
(a) 1st step is sketching all possible pictorial representation for the statements separately.
(b) 2nd step is combining possible pairs of these representations of all the statements into one.
(c) 3rd and final step is making interpretation of this combined figure.
Conclusions are true if they are supported by all the combined figures in 2nd step.

EXAMPLE

Statements :
A. All chairs are books.
B. All books are ties.

Conclusions :
I. Some ties are books.
II. Some ties are chairs.

1st Step :

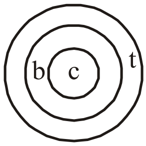


Here, 1A and 2A are representations for statement A while 1B and 2B are representations for statement B. In these representations

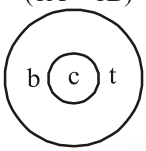
b = books
c = chairs
t = ties

2nd step :

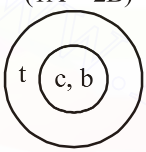
Let us combine all the possible pairs of this pictorial representations :



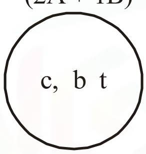
(1A + 1B)



(1A + 2B)



(2A + 1B)



(2A + 2B)

3rd step :

When we interpret the pictures in step II, we find that all the pictures support both the conclusions. Therefore, conclusion I :

"Some ties are books" and

conclusion II.

"Some ties are chairs"

both are true.

> ***Note :** In the Venn diagram method, any conclusion given with any problem will be true if and only if it is supported by all the combined pictorial representations through 2nd step. If any pictorial representation contradicts the given conclusion, it will be put in the category of incorrect or wrong conclusion.*

POSSIBILITY

Possibility is a concept of inconsistency for an event which is not yet verified but if true would explain certain facts or phenomena.

Generally, the meaning of possibility is probability, *viz*. possibility exists where nothing is certain between the objects. In general language determination of possibility exist easily in that condition when between two objects have no certainty or the truth facts accordingly.

Let's understand below table in which possibility exists where no definite relation occurs between the objects and definite or proper relation between the objects eliminate existance of any possibility. In simple way given condition eliminates the possibility and improper condition favours the possibility. Here, we can go through with an example which will also clear the term possibility.

Condition	Possibility
Given facts	cannot be determined
Imaginary facts	can be determined

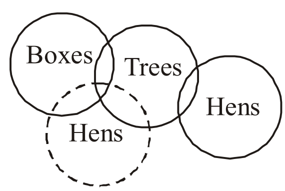
EXAMPLE

Statements Some boxes are trees
Some trees are hens.

Conclusions

I. Some boxes being hens is a possibility

II. All trees being hens is a possibility



In Conclusion I, before deciding the possibility between boxes and hens, we must notice the relation between both, we find that there is no relation between boxes and hens, so possibility favours the condition and the conclusion I is true for possibility and in Conclusion II we must notice the relation between trees and hens. We find that both have some type of relation between them so the possibility of 'All between trees and hens is true. Hence, both the Conclusions I and II follow.

❑ *Shortcut Approach*

Given Exclusive Proposition	Desired Proposition	Possibility
All	All	×
Some	Some	×
No	No	×
No	Some not	×
Some	All	✓
No proper relation	Some All	✓

***Note*:** Improper relation between two objects favours the possibility (In above example Conclusion I)

SPECIAL CASES OF EXCLUSIVE PROPOSITION

If the statement is of	Conversion	Illustration	Meaningful Conversion
Much, more, many, very, a few, most, almost	Some	Most A are B. A few X are Y.	Some A and B. Some X or Y.
Atleast	Some	Atleast some A are B.	Some A and B.
Definitely	No use	Some A are definitely B. Some X are definitely not Y.	Some A are B. Some X are not Y.
Only		Only A are B.	All B are A.
1% to 99%	Some	38% A are B. 98% X are Y.	Some A are B. Some X are Y.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-108-117
Chapter Test	–	C-29-30
Past Solved Papers		

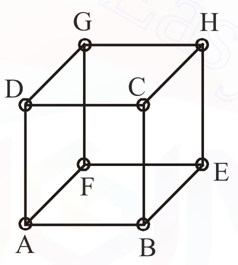
Chapter 16

Cube & Dice

CUBE

INTRODUCTION

A cube is three dimensional figure whose length, breadth and height are equal and any two adjacent faces are inclined to each other at 90°. It has 6 faces, 8 corners and 12 edges.



- Corners of the cube are A, B, C, D, E, F, G and H.
- Edges of the cube are AB, BE, EF, AF, AD, CD, BC, EH, CH, GH, DG and FG.
- Faces of the cube are ABCD, EFGH, CDGH, BCHE, ABEF and ADFG.

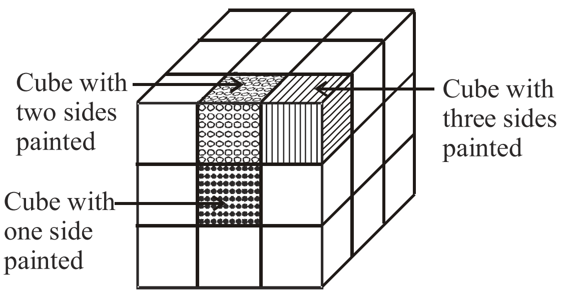
When a cube is painted on all of its faces with any colour and further divided into various smaller cubes of equal size, we get following results :

(i) Smaller cubes with no face painted will present inside faces of the undivided cube.

(ii) Smaller cubes with one face painted will present on the faces of the undivided cube.

(iii) Smaller cubes with two faces painted will present on the edges of undivided cube.

(iv) Smaller cubes with three faces painted will present on the corners of the undivided cube.

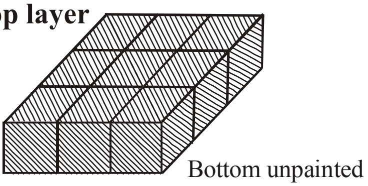


The above figure may be analysed by dividing it into three horizontal layers :

Layer I or top layer :

The central cube has only one face coloured, four cubes at the corner have three faces coloured and the remaining 4 cubes have two faces coloured.

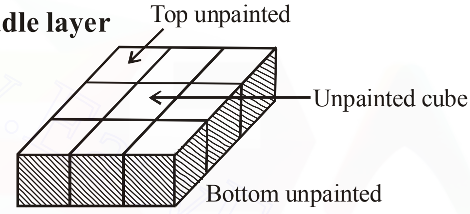
Top layer



Layer II or middle layer :

The central cube has no face coloured, the four cubes at the corner have two faces coloured and the remaining 4 cubes have only face coloured.

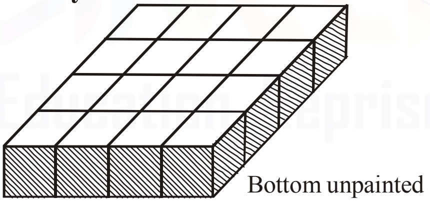
Middle layer



Layer III or bottom layer :

The central cube has only one face coloured, four cubes at the corner have three faces coloured and the remaining 4 cubes have two faces coloured.

Bottom layer



Also, if n = no. of divisions on the faces of cube

$$= \frac{\text{Length of the edge of undivided cube}}{\text{Length of the edge of one smaller cube}}.$$

❑ *Shortcut Approach*

- Number of smaller cubes with no face painted = $(n-2)^3$
- Number of smaller cubes with one face painted = $(n-2)^3 \times 6$
- Number of smaller cubes with two faces painted = $(n-2) \times 12$
- Number of smaller cubes with three faces painted = 8

EXAMPLE 1. A cube is painted blue on all faces is cut into 125 cubes of equal size. Now, answer the following question :
How many cubes are not painted on any face?

Sol. Since, there are 25 smaller cubes of equal size, therefore, n = number of divisions on the face of undivided cube = 5.
Number of cubes with no face painted = $(n-2)^3$
$= (5-2)^3 = 27$

DICE

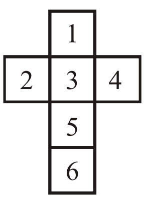
INTRODUCTION

A dice is three-dimensional figure with 6 surfaces. It may be in the form of a cube or a cuboid. After observing these figures, we have to find the different side (opposite or adjacent sides) of the dice.

Dice Formation

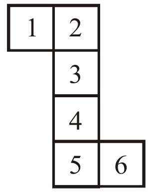
A Dice is formed by folding a sheet of paper. These forms may be

Form 1:



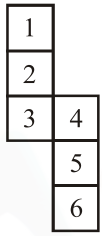
Number 1 is opposite to 5.
Number 2 is opposite to 4.
Number 3 is opposite to 6.

Form 2:



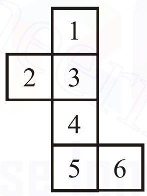
Number 1 is opposite to 6.
Number 2 is opposite to 4.
Number 3 is opposite to 5.

Form 3:



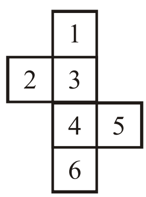
Number 1 is opposite to 3.
Number 2 is opposite to 5.
Number 4 is opposite to 6.

Form 4:

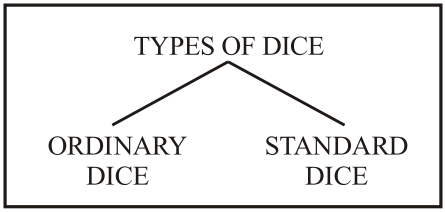


Number 1 is opposite to 4.
Number 2 is opposite to 6.
Number 3 is opposite to 5.

Form 5:

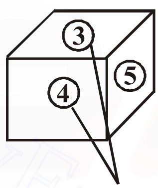


Number 1 is opposite to 4.
Number 2 is opposite to 5.
Number 3 is opposite to 6.



1. Ordinary Dice:

In this type of dice, the sum of opposite sides is not 7 but the sum of two adjacent sides are seven.



Ordinary Dice

4+3 = 7

2. Standard Dice:

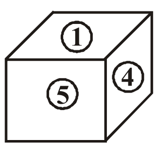
In such type of dice, the sum of opposite sides is 7 or sum of adjacent side is not 7.

3

5

4

Ordinary Dice



Here,
1+4 =5
4+5=9
1+5=6

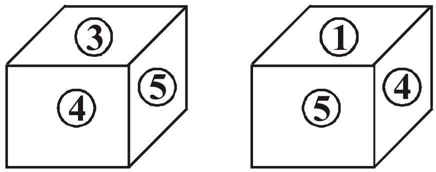
Standard Dice

Opposite of 1 . ...6 (since 1+6 =7)
Opposite of 5 . ...2 (since 5+2 =7)
Opposite of 3 . ...4 (since 3+4 =7)

IMPORTANT RULES

Rule- 1 :

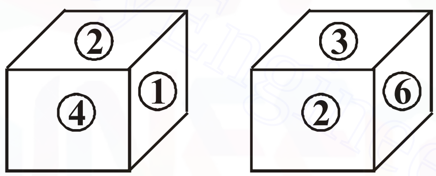
If two sides of cubes are common(has same numbers or symbols), then the remaining two will be opposites of each other.



In above shown two dices, number 4 and 5 are common in both dices, hence, 3 and 1 will be apposite to each other.

Rule 2: If one side of dices is common

If one side of given dices are common then list these sides (numbers on them) either in clock-wise or anti-clockwise. Comparing the numbers obtained from both dices will give you the opposite numbers.



In this figure, number 2 is common in both dices. Now, writing the remaining no, in clock-wise direction, we get:

2.............1. ....4 (dice 1)

2.............3. ....6 (dice 2)

Through the above observed data, we can say that:

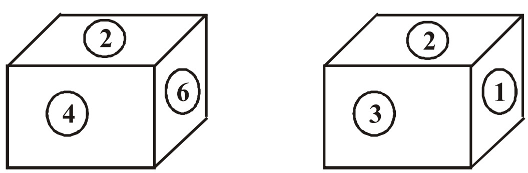
1 is opposite to 3

4 is opposite to 6

2 is opposite to 5

Rule 3 : If one side is common and it's place is same in both dices.

If one side is common in both cubes and it's place is same in both of these dices, then the remaining two sides of respective dices which appear in figure will be the opposite of each other.



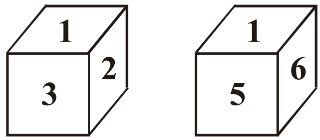
As you can see, number 2 is common in both of these dices and it appears in the same face in both these dices. In such case, the remaining two sides in both dices will be opposite to each other. In this figure, the opposite sides are :

4 is opposite to 3 (as the position of 4 and 3 are same on two dices)

6 is opposite to 1 (as the position of 6 and 1 are same on two dices)

2 is opposite to 5 (we already know the position of 1, 6, 3, 4 and 2. The only one remaining is 5)

EXAMPLE 2. Two positions of a dice are shown, when 4 is at the bottom, what number will be on the top?



(i) (ii)

(a) 1 **(b)** 2
(c) 5 **(d)** 6

Sol. From the two figures it is clear that the numbers 2, 3, 5 and 6 cannot appear opposite 1. So, 4 appears opposite 1. Therefore, when 4 is at the bottom, 1 will be on the top.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-118-123
Chapter Test	–	C-31-32
Past Solved Papers		

Chapter 17

Analytical Decision Making

INTRODUCTION

Analytical Decision Making is based on a set of relationships laid out, generally arbitrarily, from which new information can be deduced. This involves two steps-first of analysis and second of reasoning. Analytical decision making deals with questions in which you have to decide upon the course of action taken upon a candidate who has applied for a post or membership to an institution keeping in mind the essential requisites and the data given for the candidate.

CATEGORIES OF ANALYTICAL DECISION MAKING

Category I

In this type a vacancy is being declared. The necessary qualifications required by the recruiting agencies are given with certain exceptions. The qualifications and the merits of the candidates are mentioned. The decision about each candidate has to be made from amongst the five choices given, which state the courses of action to be taken as per the candidate's potential.

Category II

Here, the eligibility conditions for joining a course or availing certain benefits etc are given as against the vacancies mentioned in the former category. The qualifications of the candidates are also mentioned. The decision about each candidate is to be made from amongst the five answer choices given.

FORMAT OF THE QUESTION

Example (Directions): Read carefuly the informations given below and answer the questions based on it:

The following are the given conditions for the recruitment of a candidate as a family member in a computer institute:

(i) The candidate must be in the age range of 23 years to 28 years as on 1st November, 2013.

(ii) The candidate must have work experience as a teacher or programming experience of at least 2 years.

(iii) The candidate must have a PG degree in computer application, [MCA, M.Tech. or M.Sc. (computer science)] with not less than 60% marks.

(iv) Out of total 50 marks in the interview, the candidate must obtain 50%. In the case when a candidate

(v) Fulfils the above conditions, he/she shall be appointed as senior teacher.

(vi) Has less than 60% but more than 50% marks in his/her PG degree in computer application, he/she will be appointed as junior teacher.

(vii) Is of age more than 28 years but less than 32 years as on 1st November, 2013, the case may be reffered to the GM of the institute.

On the basis of the above mentioned conditions and information about each of the candidates in the question below, you have to decide which of the following courses of action should be than against each candidate. Point to be noted that nothing extra will be assumed except the given information. The decision must be based only on the data provided.

Mark your answer:

(a) If the candidate is to be selected as a Junior teacher

(b) If the candidate is to be selected as a Senior teacher

(c) If the case will be reffered to the GM of the institute.

(d) If the data are inadequate

(e) If the candidate is not to be selected.

QUESTIONS:

1. **Mukesh Verma** was born on 31st July, 1985. He is an M.Tech. in computer engineering with 70% marks. He has been working in an institution as a programmer for the last 7 years.

2. **Karishma Tiwari** is MCA with 72% marks. Her date of birth is 14th August, 1990. She has worked as a computer teacher for 4 years. She has got 35 marks in interview.

What You See in the given Question Format?

In the given format you can see the following things:

(1) Informations about some candidates have been provided.

(2) Some conditions have been given for candidates to fulfil in order to get selected for a particular job/ post. In case of the given format, four conditions have been given.

(3) When a candidate fulfils all the criteria except some, then different course of action has to be taken for him.

Some more things to understand

Basic conditions: In the given question format, there are four basic conditions — (i), (ii), (iii) and (iv). They are called basic conditions because they are the original conditions.

Additional conditions: In the given question format, there are two more conditions apart from the basic conditions and they are (vi) and (vii). point to be noted that (v) will not be on additional condition as it does not talk of exceptions. In fact (v) is only a totality of the four basic or original conditions given in the question format.

What is data inadequacy?

As one of the answer is given as 'data inadequate' we must be clear about what exactly does data inadequacy mean? When details given about any candidate provide no information as required by the basic conditions/additional conditions then this would be the case of data inadequacy, For example, let us see the first question given in the format. No information is given about what marks have been obtained by Mukesh Verma in the interview. Hence, the data is inadequate here.

How to solve a given problem?

Let us consider the questions given in the format and start one stepwise process.

STEP I

Write the name of the candidates in the left side and then write the symbols (i, ii, iii, iv) of the basic conditions to the top right. Now, put the symbols of the additional conditions (vi and vii) below the symbols of that basic condition with which these might be related. For example, (vi) is a condition about educational qualification and so, it is an exception of (iii). Hence (vi) should be written below (iii). Similarly, (vii) should be written below (i). Now, after the completion of step I, the following format will be prepared:

		i (vii)	ii	iii (vi)	iv
1	Mukesh Verma				
2	Karishma Tiwari				
3	Brijesh Shankar				
4	Mansi Ranjan				
5	Subodh Saxena				

NOTE : *To differentiate between basic conditions and additional conditions. The additional conditions have been encircled.*

STEP II

At the 2nd step just see the given answer choices carefully and decide which combination of the conditions leads to which conclusion. If we see the given question format with serious eye, we find that the following combination can be formed.

i + ii + iii + iv → 2 [Senior teacher]

vii + ii + iii + iv → 3 [Case will be reffered to GM]

i + ii + vi + iv → 1 [Junior teacher]

When we have decided the above three combination giving answer choices remain and the answer choice (a), (b) and (c), two answer choices remains and they are answer choice (d) and answer choice (e). The answer choice (e), which says that the candidate is not to be selected, should be chosen when any one or more of the given conditions is violated. The answer choice (d), which tells that the data are inadequate, should be chosen when no information is given about any one or more conditions.

How to examine data?

After step II you are required to read all the statements carefully. Just take each question one by one and compare then with the given conditions. Examinees are suggested to use following symbols while doing this comparision:

I If a basic condition is fulfilled mark '✓' sign below it.

II If a basic condition is violated and it is not attached with an additional condition then mark 'X' sign below it.

III If a basic condition is violated but it is attached with an additional condition, then

(A) Mark a '×' sign below it if additional condition is also violated.

(B) Mark a '✓' sign below it if additional condition is fulfilled.

IV In case of unavailability of any information about any condition, a mark '?' Will be put below that condition.

To understand point (i) to point (iv) let us see the presentation given below:

Question No.	I	II/V	III/VI	IV
1	✓	✓	✓	×
2	✓	✓	✓	✓
3	✓	(✓)	(✓)	✓
4	✓	✓	(×)	✓
5	✓	?	✓	✓

Now just see the explanation of above table:

(1) I, II, III and IV are basic conditions while (V) and (VI) are two additional conditions. (V) is attached to II and (VI) is attached to III.

(2) In question (1), I, II and III are satisfied while VI is violated

(3) In question (2), all the basic conditions I, II, III and IV are satisfied

STEP III

(i) One by one, read the questions very carefully and compare the facts given with the various condition.

(ii) Mark the appropriate sign or '✓' or '×' (✓) or (×)? As required

(iii) When a '×' or a (×) sign is obtained, then stop examining further and without any hesitation select the answer choice "not to be selected" for that particular question. In another words whenever you get '×' or (×) sign, do not take any botheration to examine the remaining condition, select your answer as "not to be selected and quickly move on to the next question. It so happens because, if a condition as well as its additional condition is violated, it does mean that one necessary requirement is not being fulfilled. Hence, we reach at a conclusion that the selection is not possible even it other conditions are fulfilled.

STEP IV

Now, this is the time to select your answer choices on the pattern given below:

(i) If find a '×' or (×) below any condition, go for the answer choice "not to be selected"

(ii) If you find no cross mark but there is a question mark below any condition, your answer choice would be "data are inadequate".

(iii) If you find neither any cross mark nor any question mark, than compare the combination with the three answer combinations obtained in step II and select the answer choice accordingly.

After understanding the above steps, now we are at a position of solving the question given in the question format. Let us see the solution:

Solution:

Question No.		(i) / (vii)	(ii)	(iii)/ (vi)	(iv)
1	Mukesh Verma	(✓)	✓	✓	?
2	Karishma Tiwari	✓	✓	✓	✓
3	Brijesh Shankar	(×)	✓	(✓)	✓
4	Mansi Ranjan	✓	✓	(✓)	×
5	Subodh Saxena	✓	✓	(✓)	✓

Condition (V) is attached to II while the additional condition is VI attached with the basic condition III.

STEP WISE EXPLANATION OF ABOVE TABLE:

Step I

At the step I level, we read the question carefully and find out that there are four, basic conditions (i), (ii), (iii) and (iv) and two additional conditions (vii) and (vi). further, it is clear that '(vii)' is an exception of '(i)' and '(vi)' is an exception of '(iii)'. Now we write the name of the candidates in extreme left and then put the basic conditions (i), (ii), (iii) and (iv) at the top-right of the candidate in question 1. Next, we write additional condition '(vii)' below 'o' and additional condition '(vi)' below '(iii)'.

Step II

At the 2nd level, we look at the answer choices and prepare one answer combinations accordingly. This will be:

i + ii + iii + iv ⇒ b

vii + ii + iii + iv ⇒ c

i + ii + vi + iv ⇒ a

Step III

At the step III level, we read every question carefully and compare the facts given in it with the various conditions.

Let us see the detailed analysis of every candidate question wise.

Mukesh Verma

He is an M.Tech in computer engineering with 70% marks. This fulfills condition C. Hence we write '✓' mark below C. Next, his date of birth is 31st July, 1985. Here, we do a mental calculation that on 31st July, 2013 he turned 28th. This is the reason that on 1st November 2013, he is more than 28 years. Therefore, (i) is violated, but the additional condition of (i) is (vii) which is fulfilled and we write (✓) mark here. Further, Mukesh Verma is having a programming experience of 7 years (more than 2 years). So we mark (✓) below (ii). Lastly, there is no information about marks of Mukesh in the interview. Thus the sign of question mark '?' is put below d.

Karishma Tiwari

Karishma is an MCA with 72% marks. This fulfills (iii), so we put the mark '✓' below (iii). Her date of birth is 14th August, 1990, So on 1st November, 2013, she is more than 23 years. This fulfills '(i)' and hence we put a (✓) mark below '(i)'. She is a computer teacher from last 4 years. This fulfils (ii) and we put (✓) mark below (ii), lastly, she has obtained 35 marks in the interview. This marks is more than the required 50% (25 marks out of 50 marks), therefore (iv) is also fulfilled and we put (✓) mark below (iv).

Step IV

At 4th level we select the answer choices.

Sol. 1. No cross mark. But a question mark is available. Hence, data is inadequate.

Sol. 2. i + ii + iii + iv ⇒ b [step II]

So, the candidate is to be selected as a senior teacher.

❑ Shortcut Approach

- For selection all basic conditions must be fulfilled.
- For rejection atleast one independent basic condition must be violated/basic '+' additional condition must be violated.
- If a basic condition is violated but an additional condition attached with it is fulfilled and all other remaining basic conditions are fulfilled, then the case will be referred to the person given in the questions.
- Once the symbol ×/(×) is put in the table, there is no need to check further conditions as person is declared rejected at this stage only.
- If for one basic condition, the data is not given while all other basic conditions are fulfilled, it means data is inadequate.
- If any information is not given and answer choices don't have data inadequate option, then condition related to that particular information is supposed to be violated.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-124-129
Chapter Test	–	C-33-34
Past Solved Papers		

Chapter 18

Series

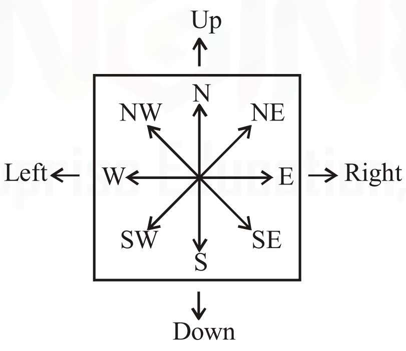
INTRODUCTION

The word **"series"** is defined as anything that follows or forms a specific pattern or is in continuation of a given pattern or sequence.

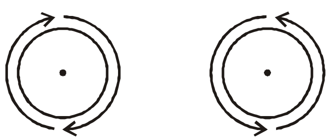
In this type of non-verbal test, two sets of figures pose the problem. The sets are called Problem Figures and Answer Figures. Each problem figure changes in design from the preceding one.

❑ *Shortcut Approach*

- **Directions** – There are eight directions as follows :



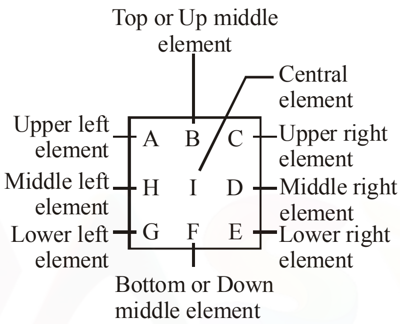
- **Rotational Directions –**
There are two rotational directions as follows :



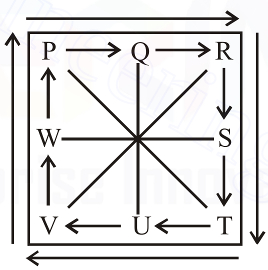
Clockwise direction (CW)

Anticlockwise direction (ACW)

- **Positions of Elements –**



- **Movement of Elements Through Distance –**



Clockwise Movement

$P \to Q = \frac{1}{2}$ arm/step

$P \to R = 1$ arm/step

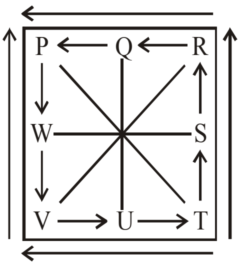
$P \to S = 1\frac{1}{2}$ arm/step

$P \to T = 2$ arm/step

$P \to S = 2\frac{1}{2}$ arm/step

$P \to R = 3$ arm/step

$P \rightarrow Q = 3\frac{1}{2}$ arm/step



Anti Clockwise Movement

$P \rightarrow W = \frac{1}{2}$ arm/step

$P \rightarrow V = 1$ arm/step

$P \rightarrow U = 1\frac{1}{2}$ arm/step

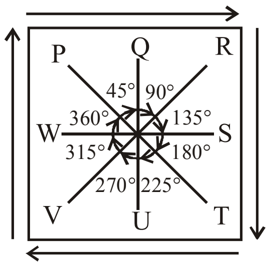
$P \rightarrow U = 2\frac{1}{2}$ arm/step

$P \rightarrow V = 3$ arm/step

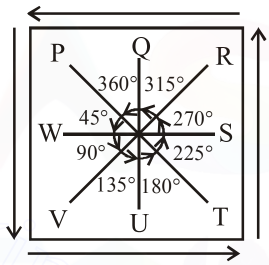
$P \rightarrow W = 3\frac{1}{2}$ arm/step

$P \rightarrow P = 3\frac{1}{2}$ arm/step

- **Directional Movement of Elements–**



Clockwise Movement



Anticlockwise Movement

TYPES OF SERIES

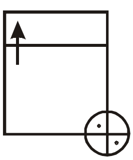
Type-I

A definite relationship between elements in given figures.

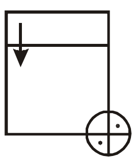
EXAMPLE 1.

Study the problem figures marked (A), (B) and (C) carefully and try to establish the relationship between them. From the answer figures marked a, b, c and d, pick out the figure which most appropriately completes the series.

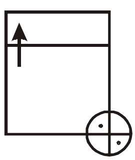
Problem Figures



(A)

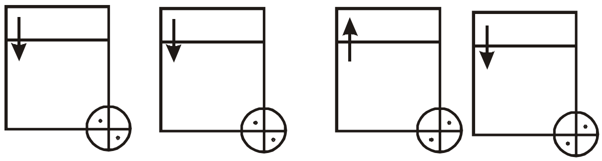


(B)



(C)

Answer Figures



(a) (b) (c) (d)

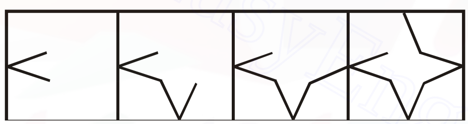
Sol. The direction of arrow which changes alternately. The dots are also changing alternately. Hence, we are looking for a figure in which the arrow points down and the dots and positioned as in figure (b).

TYPE II. Additions of Elements :

In these type of questions, each figure is obtained by either sustaining the element of preceding figure as it is or adding a part of element or one element or more than one element of the preceding figure in a systematic way.

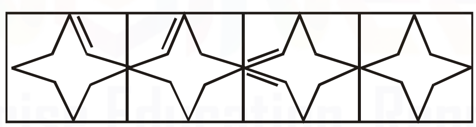
EXAMPLE 2.

Problem Figures



(A) (B) (C) (D)

Answer Figures



(a) (b) (c) (d)

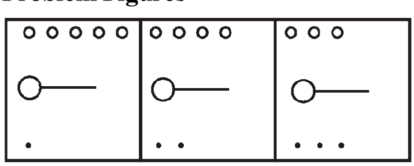
Sol. Two line segments are added in A to obtain B and one line segment is added in B to obtain C. This process is repeated again to obtain D. Hence, answer figure (d) continues the series.

TYPE III. Increasing/Decreasing of Elements:

In these questions, the items in the diagrams either increase or decrease in number.

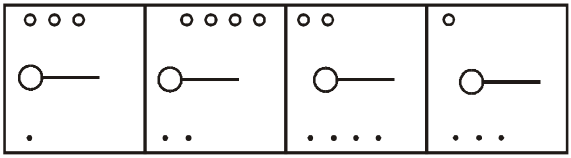
EXAMPLE 3.

Problem Figures



(A) (B) (C)

Answer Figures



(a) (b) (c) (d)

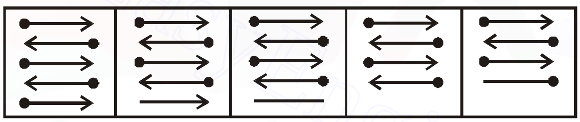
Sol. The small circles are decreasing consecutively and the black dots are increasing. So, figure (c) continues the series.

TYPE IV Deletion of Elements :

In these type of questions, each figure is obtained by either sustaining the element of preceding figure as it is or deleting a part of an element or one element or more than one element of the preceding figure in a systematic way.

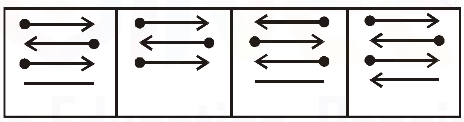
EXAMPLE 4.

Problem Figures



(A) (B) (C) (D) (E)

Answer Figures



(a) (b) (c) (d)

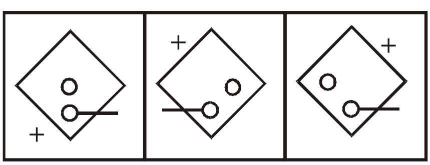
Sol. The qualitative characteristic of various elements in the diagrams change to complete the series. So, figure (a) continues the series.

TYPE V Rotation Type :

The various elements in the diagrams move in a specific manner. They may rotate in clockwise or anti-clockwise direction.

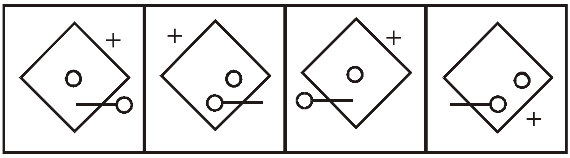
EXAMPLE 5.

Problem Figures



(A) (B) (C)

Answer Figures



(a) (b) (c) (d)

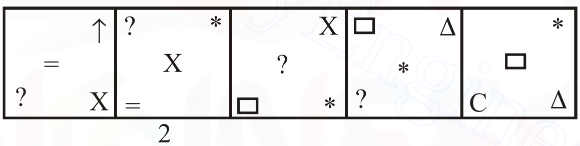
Sol. The sign of plus is rotating clockwise. The pin changes direction alternately. So, figure (d) coninues the series.

TYPE VI Replacement of Elements :

In these type of questions, each figure is obtained by either sustaining the element of preceding figure as it is or replacing a part of element or one element or more than one element by a new element of the preceding figure in a systematic way.

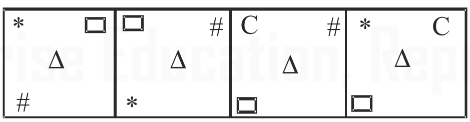
EXAMPLE 6.

Problem Figures



(A) (B) (C) (D) (E)

Answer figures



(a) (b) (c) (d)

Sol. The elements positioned at north-east (NE) corners disappear from the odd-numbered figures. The elements positioned at the south-west (SW) corners disappear from the even-numbered figures. Therefore * should not appear in the answer figure. Hence (a), (b) and (d) cannot be the answers. Also new elements are introduced at the NE corners in even-numbered figures. Therefore, answer figure (c) continues the given series.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-130-133
Chapter Test	–	C-35-36
Past Solved Papers		

Chapter 19

Mirror & Water Images

Mirror Images

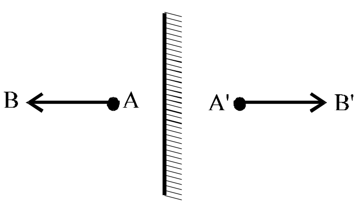
INTRODUCTION

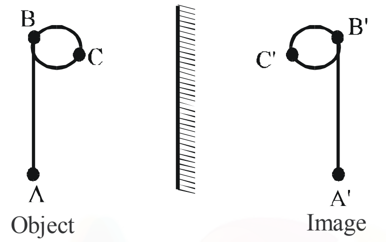
In this category, questions are based on the criteria that a few figures are given and you have to find out which one is the exact image of the given figure in a mirror placed in front of it. This image formation is based on the principle of 'lateral inversion' which implies that size of the image is equal to the size of the object but both sides are interchanged. The left portion of the object is seen on the right side and right portion of the object is seen on the left side. For example, mirror image of ABC = ƆᗺA

Note : There are '11' letters in English Alphabet which have identical mirror images: A, H, I, M, O, T, U, V, W, X, Y.

Characteristics of Reflection by plane mirror

1. Perpendicular distance of object from mirror = Perpendicular distance of image from mirror.
2. The image is laterally inverted.





3. The line joining the object point with its image is normal to the reflecting surface.
4. The size of the image is the same as that of the object.

I. Mirror Images of Capital Letters

A	A	N	И
B	ᗺ	O	O
C	Ɔ	P	ꟼ
D	ᗡ	Q	Ϙ
E	Ǝ	R	Я
F	ꟻ	S	Ƨ
G	Ә	T	T
H	H	U	U
I	I	V	V
J	Ⴑ	W	W
K	ꓘ	X	X
L	⅃	Y	Y
M	M	Z	Ƹ

II. Mirror Images of Small Letters

a	ɒ	n	n
b	d	o	o
c	ɔ	p	q
d	b	q	p
e	ɘ	r	ɿ
f	ɟ	s	ƨ
g	ϱ	t	ƚ
h	ᑋ	u	u
i	i	v	v
j	ᒑ	w	w
k	ʞ	x	x
l	l	y	γ
m	m	z	ƹ

III. Mirror Images of Numbers

0	0	6	∂
1	1	7	Γ
2	Ƨ	8	8
3	Ɛ	9	ϱ
4	ᔭ	10	01
5	ƽ		

IV. Mirror Images of Clock:

There are certain questions in which the position of the hour-hand and the minute-hand of a clock as seen in a mirror are given. On the basis of the time indicated by the mirror-image of the clock we have to detect the actual time in the clock. In the solution of such questions we use the fact that if an object A is the mirror-image of another object B then B is the mirror-image of A.

❑ *Shortcut Approach*

Whenever you have to solve a mirror image question, imagine a mirror placed in front of the object and then try to find its inverted image. The portion of the object that is near the mirror will now be the portion of the image near to the mirror in the inverted form.

EXAMPLE 1.

By looking in a mirror, it appears that it is 6 : 30 in the clock. What is the real time ?

Sol. As,

Time = 6 : 30



(Fig A)



Time = 5 : 30

(Fig B)

Clearly, fig (A) shows the time (6 : 30) in the clock as it appears in a mirror. Then its mirror-image i.e. Fig (B) shows the actual time in the clock i.e. 5 : 30. You can solve it quickly if you remember that the sum of actual time and image time is always 12 hours.

Water Images

The reflection of an object as seen in water is called its water image. It is the inverted image obtained by turning the object upside down.

Water-images of Capital Letters

Letters	A	B	C	D	E	F	G	H	I	J	K	L	M
Water-image	∀	B	C	D	E	Ⅎ	Ͼ	H	I	ſ	K	Γ	W
Letters	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Water-image	И	O	Ь	Ό	ꓘ	Ƨ	⊥	∩	Λ	M	X	⅄	Z

Water-images of Small Letters

Letters	a	b	c	d	e	f	g	h	i	j	k	l	m
Water-image	ɐ	p	c	q	ə	ɟ	ƃ	ɥ	!	ſ	ʞ	l	ɯ
Letters	n	o	p	q	r	s	t	u	v	w	x	y	z
Water-image	u	o	b	d	ɹ	s	ʇ	n	ʌ	ʍ	x	ʎ	z

Water-images of Numbers

Letters	0	1	2	3	4	5	6	7	8	9
Water-image	0	⇂	ᄅ	Ɛ	ㄣ	ϛ	9	ㄥ	8	6

Note :

1. The letters whose water-images are identical to the letter itself are : C, D, E, H, I, K, O, X
2. Certain words which have water-images identical to the word itself are : KICK, KID, CHIDE, HIKE, CODE, CHICK

❑ *Shortcut Approach*

Whenever we have to analyze the water image of an object, imagine a mirror or a surface that forms an image just under the given object. The portion of the object that is near the water surface will be inverted but will be near the water surface in the image as well.

EXAMPLE 2.

Find the correct option for the water images below:

S T O R E
―――――――――― ← water surface
?

Sol. In case of water image, the water reflection will usually be formed under the object / word.

In this case, the water image of the word will be an outcome of the water images of each of the letters like, the water images of S is Ƨ, T is ⊥, O is O, R is ꓘ and E is E . Thus, the water image of the word 'STORE' is 'Ƨ ⊥ O ꓘ E.'

S T O R E
――――――――――
Ƨ ⊥ O ꓘ E

❑ Shortcut Approach

(i) While solving a question, try eliminating some options and solving the questions will become easier. To eliminate options, keep in mind the pattern used in the object (given diagram whose image is to be formed) as well as the position of mirror or water such that the portion of the object near to the mirror / water will produce the same portion near the mirror / water in an inverted form.

(ii) Images are images, be it water or mirror, in both the cases an inverted image of the alphabets / numerals / clocks / any other object are formed by inverting the object. Inverting of the object solely depends upon the position of mirror or water surface w.r.t. the object.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-134-137
Chapter Test	–	C-37- 38
Past Solved Papers		

Chapter 20

Paper Cutting and Folding

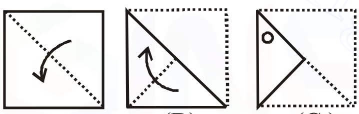
INTRODUCTION

In this section, a sheet of paper is folded in given manner and cuts are made on it. A cut may be of verying designs. We have to analyze how this sheet of paper will look when paper is unfolded.

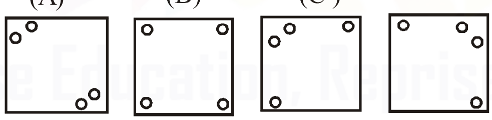
Note that when a cut is made on folded paper, the designs of the cut will appear on each fold.

EXAMPLE 1.

Directions In the following example, figures A and B show a sequence of folding a square sheet. Figure C shows the manner in which folded paper has been cut. You have to select the appropriate figure from alternatives which would appear when sheet is opened.

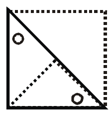


(A) (B) (C)

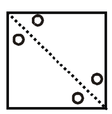


(a) (b) (c) (d)

Sol. Step I-When sheet C is unfolded once, it will appear as follows

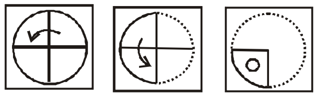


Step II -

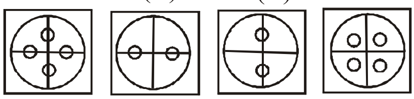


Clearly, the circle will appear in each of the triangular quarters of the paper. So, figure (c) would appear when sheet is opened.

EXAMPLE 2.



(A) (B) (C)



(a) (b) (c) (d)

Sol. Here, a circular cut is made on the quarter circle. Hence, this sheet, when completely unfolded, will contain small circle on each quarter and will appear as option (d).

❑ Shortcut Approach

- Consider a mirror placed on the dotted line facing the portion/part which is to be folded and the mirror image thus obtained is superimposed on the design of the other side to get the folded pattern.
- When more than one fold is made before punching then virtually try to unfold each fold one by one and predict the complete unfolded pattern.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-138-142
Chapter Test	–	C-39- 40
Past Solved Papers		

Chapter 21

Completion of Figures

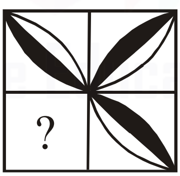
INTRODUCTION

In this section, an incomplete figure is given, in which some part is missing. We have to choose the segment, given in choices, that exactly fits into the blank portion of figure so that the main figure is completed.

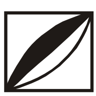
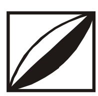
Note : If you observe carefully, you notice that the missing portion may be the mirror image of any one of the quarters.

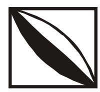
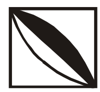
EXAMPLE 1.

Select from alternatives the figure (X) that exactly fits in the main figure to complete its original pattern.



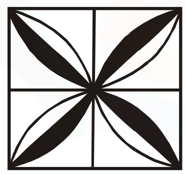
(X)

(a)  (b) 

(c)  (d) 

Sol.

In this question, half shaded leaf is moved clockwise. So, option (b) is right one.



❑ *Shortcut Approach*

- If answer figures contain similar figure but in rotated forms, then the correct answer figure is that figure which can be substituted at the missing part with least change in orientation.
- The correct option for the missing figure can be given in any rotated from, so student can rotate the figures to check the correctness of option.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-143-149
Chapter Test	–	C-41-42
Past Solved Papers		

Chapter 22

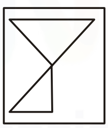
Hidden / Embedded Figures

INTRODUCTION

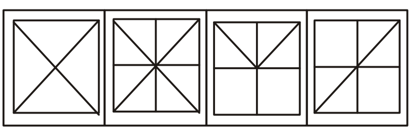
A figure (X) is said to be embedded in a figure Y, if figure Y contains figure (X) as its part. Thus problems on embedded figures contain a figure (X) followed by four complex figures in such a way that fig (X) is embedded in one of these. The figure containing the figure (X) is your answer.

EXAMPLE 1.

Directions : In each of the following examples, fig (X) is embedded in any one of the four alternative figures (a), (b), (c) or (d). Find the alternative which contains fig. (X) as its part.

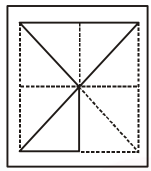


(X)



(a) (b) (c) (d)

Sol. Clearly, fig. (X) is embedded fig. (b) as shown below :



Hence, the answer is (b)

❑ Shortcut Approach

- There may be some questions in which the question figure is not directly embedded in any of the answer figure. In these type of questions, change the orientation of question figure to find the correct answer figure.
- In some questions, the question figure embedded in two or more answer figures, then the most appropriate answer is that in which the question figure is embedded with least change in its orientation.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-150-152
Chapter Test	–	C-43-44
Past Solved Papers		

Chapter 23

Figure Formation and Analysis

INTRODUCTION

In this topic, a question is one of the following types :

I. Formation of triangles/square/rectangle etc. either by joining of three figures after choosing them from the given five figures or by joining any other pieces after selecting them from given alternatives.

II. Making up a figure from given components.

III. Making up a three dimensional figure by paper folding.

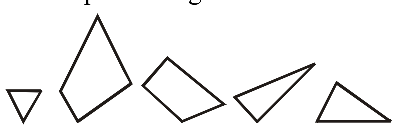
IV. Rearrangement of the parts of given figure.

V. Fragmentation of key figure into simple pieces.

TYPE-I: Formation of triangles/square/rectangle etc. either by joining of three figures after choosing them from the given five figures or by joining any other pieces after selecting them from given alternatives.

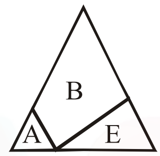
EXAMPLE 1.

A set of five figures (A), (B), (C), (D) and (E) are followed by four combinations as the alternatives. Select the combination of figures which if fitted together, will form a complete triangle.



(A) (B) (C) (D) (E)

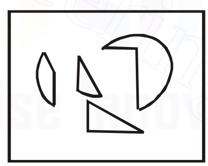
Sol. If figures A, B and E are fitted together, the resultant figure will be a triangle.



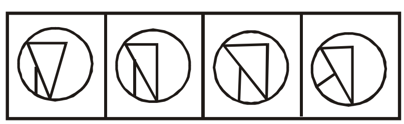
TYPE-II: Making up a figure from given components

EXAMPLE 2.

Find out which of the alternatives (a), (b), (c) and (d) can be formed from the pieces given in box ‘X’.



(X)



(a) (b) (c) (d)

Sol.

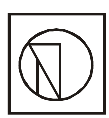
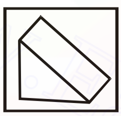


Figure (b) can be formed from the pieces the given in box 'X'.

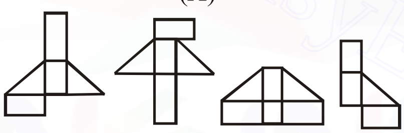
TYPE-III : Making up a three dimensional figure by paper folding. In this type, we have to analyze when a paper folded along the lines, how a three dimensional figure look like. Sometimes, a key figure is given which is made by folding one of the four figures given in alternatives. We have to determine which figure can be used to create the key figure.

EXAMPLE 3.

A figure 'X' is given. You have to choose the correct figure, given in the alternatives, when folded along the lines, will produce the given figure 'X'.



(X)



(a) (b) (c) (d)

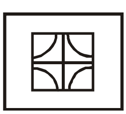
Sol. Figure (a) will produce the given figure 'X'

TYPE-IV : Rearrangement of the parts of given figure.

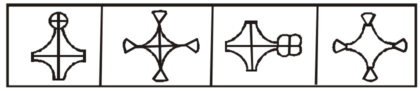
In this type of questions, a key figure is given. We have to identify the figure from alternatives that is a rearrangement of parts of key figure.

EXAMPLE 4.

Which figure is the rearrangement of the parts of the given figure.



(X)



(a) (b) (c) (d)

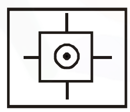
Sol. Figure (a) is the rearrangement of the parts of the given figure 'X'.

TYPE-V : Fragmentation of key figure into simple pieces.

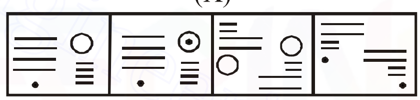
This type is opposite to **TYPE-II.** In this type, a key figure is given and every alternatives has different pieces. We have to select the set of pieces that can make the given key figure.

EXAMPLE 5.

Find out which of the alternatives will exactly make up the key figure (X)



(X)



(a) (b) (c) (d)

Sol. Figure (a) will exactly make up the key figure 'X'

❑ Shortcut Approach

- The number of elements given to form a figure must be equal to the elements present in the answer figure. This will help you to easily eliminate some of the option figures.
- The size of pieces of figures in the question figure and the size of pieces used to form a figure may vary but their shapes must have to be similar.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-153-157
Chapter Test	–	C-45- 46
Past Solved Papers		

Chapter 24

Visual Reasoning

INTRODUCTION

Visual intelligence measures the ability to process visual material and to employ both physical and mental images in thinking. As a result people with a high visualization find it easier to comprehend information and communicate it to others. Your visualization skills determine how well you perceive visual patterns and extract information for further use. Visualization also facilitates the ability to form associations between pieces of information something which helps improve long term memory.

Types of Visual Reasoning

(A) Odd-Man Out Type

(B) Counting of Figures

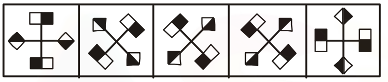
(A) ODD-MAN OUT TYPE

1. Rotation of same Figure

This is the most common type of classification. The similar figures are actually the rotated forms of the same figure in clockwise or anti-clockwise direction. The figure which comes out to be different from other is that figure which cannot be obtained by rotation of either of the other figures,

EXAMPLE 1.

Directions : In the following question, a group of five figures is given. Out of which four figures are similar to each other in a certain way and one is different from other. Find the odd figure out.



(a) (b) (c) (d) (e)

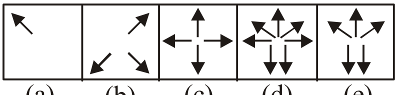
Sol. After examining the above figure, it is found that except (d) all figures can easily be obtained by clockwise and anti-clockwise movement or each other.

2. Number of Elements or Lines

A group of figure may be classified on the basis of number of elements or the number of lines present in figures. The figures can also be classified on even or odd number of lines or elements present in figures. Classification can also be done on the ratio of number of lines and elements.

EXAMPLE 2

Directions : In the following question, a group of five figures is given. Out of which four figures are similar to each other in a certain way and one is different from other. Find the odd figure out.



(a) (b) (c) (d) (e)

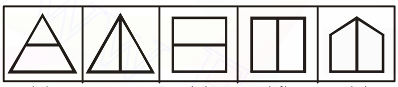
Sol. All except figure (c) contains odd number of arrows.

3. Division of Figures

This type of classification is done on the equal or inequal division of figures or divisioin of figure in some specified ratio or parts.

EXAMPLE 3.

Directions : In the following question, a group of five figures is given. Out of which four figures are similar to each other in a certain way and one is different from other. Find the odd figure out.



(a) (b) (c) (d) (e)

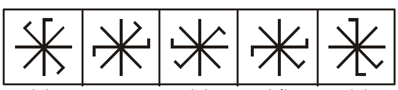
Sol. Except figure (a) all figures are divided into two equal parts.

4. Similarity of Figures

Classification on the basis of similarity of figure is done when orientation, shape, measure of angle or method of presentation of group is same except for the odd figure.

EXAMPLE 4.

Directions : In the following question, a group of five figures is given. Out of which four figures are similar to each other in a certain way and one is different from other. Find the odd figure out.



(a) (b) (c) (d) (e)

Sol. Let us consider the two adjacent bent lines as a pair. Then, in each figure except (d) there are two straight lines between the bent pair and the remaining bent line when the direction of bent is considered.

5. Relation between Elements of Figure

In this type of classification, the elements of the figure bears a certain relationship between them in which the odd figure does not posses. This relation can be based on shape of elements presents, inversion of elements etc.

EXAMPLE 5.

Directions : In the following question, a group of five figures is given. Out of which four figures are similar to each other in a certain way and one is different from other. Find the odd figure out.



(a) (b) (c) (d) (e)

Sol. Except figure (c) in all the figures, both the inside and outside figures are similar but differ in size.

6. Interior-Exterior Consideration of Elements

A figure can be formed from two or more elements, it is likely that some elements may lie in interior of other elements while some may lie in the exterior of the other elements. This consideration can be used for classification of elements from a group.

EXAMPLE 6.

Directions : In the following question, a group of five figures is given. Out of which four figures are similar to each other in a certain way and one is different from other. Find the odd figure out.



(a) (b) (c) (d) (e)

Sol. Only figure (d) does not contain any element present in the interior of the closed figure.

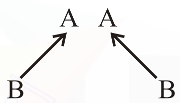
(B) COUNTING OF FIGURES TYPE

Type-1 : Counting of Straight Lines and Triangles

(a) Straight lines

A. Horizontal line 

B. Vertical line 

C. Slant line 

❑ *Shortcut Approach*

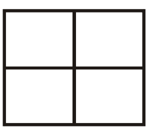
- Consider a line (AB) given



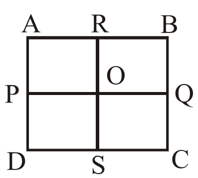
- Then, on counting, it will be counted as one line, i.e., AB and not as a two straight lines AC and CB.

EXAMPLE 1.

How many straight lines are there in the figure ?



Sol.



Horizontal lines = AB + PQ + DC = 3

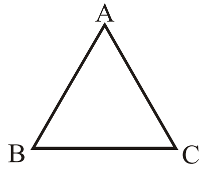
Vertical lines = AD + RS + BC = 3

Slant lines = 0

∴ Total lines = 3 + 3 + 0 = 6

(b) Triangle –

It is a closed figure bounded by three side.

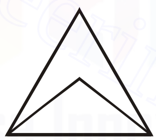


❑ *Shortcut Approach*

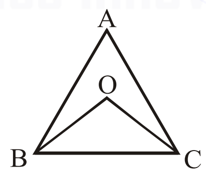
- Smallest triangles are counted first.
- Now, counted those triangles which are formed with the two triangles and further counting goes on in the same way.
- Largest triangle is counted in the last.

EXAMPLE 2.

How many triangles are there in the figure ?



Sol.



Smallest triangle = BOC = 1

Largest triangle = ABC = 1

∴ Total triangle = 1 + 1 = 2

Type-2 : Counting of Quadrilaterals and Polygons

(a) Square

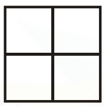
It has four equal sides, equal diagonals, and each of the four angles equal to 90°.

❑ Shortcut Approach

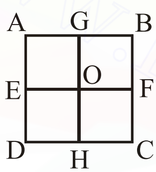
- Count smallest squares first.
- Now, count squares which are formed with two squares and further counting goes on in the same way.
- Largest square is counted in the last.

EXAMPLE 3.

How many square are there in the figure ?



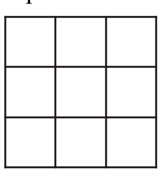
Sol.



Smallest squares
= AGOE + GBFO + EOHD + OFCH
= 4
Square formed with four squares
= ABCD = 1
∴ Total squares = 4 + 1 = 5

Formula for Counting Squares

Let r be the number of rows and c be the number of columns.
Now, total number of squares
$= (r \times c) + \{(r-1) \times (c-1) + (r-2) \times (c-2) + ...$
The terms are continued upto the term which is equal to zero (0). This method is applicable only to the figure. where each row and column is divided into squares of equal sections.



(b) Rectangle

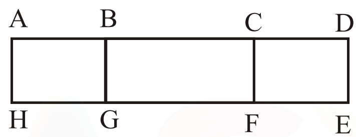
It has four sides, and opposite sides are equal. It has equal diagonals and each of the four angles is equal to 90°.

EXAMPLE 4.

How many rectangles are there in the figure?



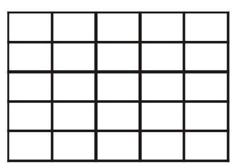
Sol.

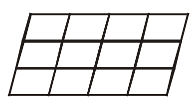


Smallest rectangles = ABGH + BCFG + CDEF = 3
Rectangles formed with two rectangles = ACFH + BDEG = 2
Largest rectangles = ADEH = 1
∴ Total rectangles = 3 + 2 +1 = 6

Formula for Counting of Rectangles and Parallelograms

Let r be the number of rows and c be the number of columns. Now, total number of rectangles or parallelograms
$= [(r + (r-1) + (r-2) + ... +1] \times [c + (c-1) + (c-2) + ... + 1]$





The method is applicable only to the figure, where each row and column is divided into rectangle of equal sections.

Type-3 : Circle

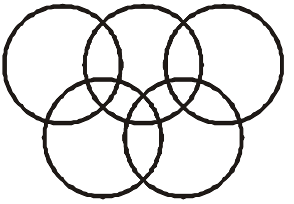
Circle is a closed figure. It has zero sides.

❑ Shortcut Approach

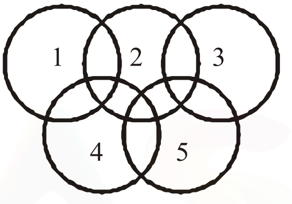
- Keep writing numbers one by one inside the circles starting from 1 i.e., for 1st circle put 1, for 2nd circle put 2, for 3rd circle put 3 and so on.
- The number which is put for the last circle is the required number of circles.

EXAMPLE 5.

How many circles are there in the figure ?



Sol. Here, we start counting of circles and mark them, as 1, 2 and so on and finally we end on getting 5 number of circles as shown below:



ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-158-163
Chapter Test	–	C-47-48
Past Solved Papers		

ANALYTICAL REASONING

Chapter 25

Evaluating Inferences

INTRODUCTION

This chapter makes you aware about a special type of question pattern which has become a regular trend of almost all type of competitive examination. An inference is a logical conclusion on evidence. A valid inference is believable and realistic. As per the pattern, a passage is given followed by some inferences (conclusions) and the examinee is asked to decide whether a given inference follows or not in the light of the given passage. Let us see the format below:

What is the problem like?

Problem Format/ Sample Problem:-

Directions (Qs 1-5): Below is given a passage followed by several possible inferences which can be drawn from the facts stated in the passage. You have to examine each inference separately in the context of the passage and decide upon its degree of truth or falsity.

Mark answer:

(a) If the inference is definitely true i.e., it properly follows from the statement of facts given.

(b) If the inference is 'probably true' though not definitely true in the light of the facts given.

(c) If the 'data are inadequate' i.e. from the facts given you can not say whether the inference is likely to be true or false.

(d) If the inference is 'probably false' though not definitely false' in the light of the facts given.

(e) If the inference is 'definitely false' i.e., it cannot possibly be drawn from the facts given or it contradicts the given facts.

PASSAGE

In its most ambitions bid ever to house 6 crore slum dwellers and realise the vision of a slum-free India, the government is rolling out a massive plan to build 50 lakh dwelling units in five years across 400 towns and cities. The programme could free up thousands of acres of valuable government land across the country and generate crores worth of business for real estate developers. Proliferation of slums has had an adverse impact on the GDP growth for years. Slum dwellers are characterised by low productivity and susceptibility to poor health conditions. The government believes that better housing facilities will address social issues and also have a multiplier effect and serve as an economic stimulus.

Q 1. Development of land occupied by slums in cities of India will not have any effect on the common public.

Q 2. Majority of the slums in cities and towns in India are on prime private properties.

Q 3. Per capita income of slum dwellers is significantly lower than that of those living in better housing facilities.

Q 4. Cities and towns of developed countries are free from slums.

Q 5. Health and sanitary conditions in slums are far below the acceptable norms of human habitat in Indian cities and towns.

Before solving the sample problem, we must see the pattern of the problem and find out what it puts before the students to think.

A minute look will make you clear that here the examiner has graded the choices very closely. He/ she has given two positive choices instead of one.

i. Definitely true
ii. Probably true

Further, he/ she has also given two negative choices instead of one:-

i. Definitely false
ii. Probably false

This pattern requires a deeper thinking as it leaves before you following areas of confusion:-

1. Definitely true or probably true
2. Definitely false or probably false
3. Data inadequate or probably true
4. Data inadequate or probably false

1. Definitely true or probably true:

If the given inferences is a direct consequences of something given in the passage, then it falls under the category of definitely true. But the confusion may arise when the given inference is not directly stated in the passage but it appears 'almost' definitely true to you. But as it is not clearly stated in the passage, you may think that even 'Probably true' could be the answer. To get rid of this confusion, you have to recheck your reasoning. If the given inference has not been mentioned directly in the passage, then you must have assumed something 'extra' to draw this conclusion. Now, ask the following questions from yourself.

(A) Is the extra assumption an universal truth?
(B) Can the extra assumption never be false?

If you find 'yes' for the question (A) and 'no never' for the question (B), then accept it as definitely true, otherwise pick 'Probably true'.

2. Definitely false or probably false

If the given inference does not follow from the passage, it falls under the category of definitely false. But confusion may arise when the given inference is not given directly in the passage and seems 'almost' definitely false. But as related things are not mentioned clearly in the passage, you think that 'probably false' may be correct. To get rid of this confusion try to recheck your reasoning. If the opposite of the inference has not been mentioned in the passage, then you must assume something extra to reach your conclusion. Just ask the following questions to yourself.

(A) Is this assumption an universal truth?
(B) Can this assumption never be false?

If you find 'yes' for question (A) and 'no, never' for question (B) then select your answer as definitely false, otherwise probably false will be your correct answer.

3. Data inadequate or probably true

When an indirect inference is drawn from the passage, this confusion may arise. As the given inference is not explicitly mentioned, you think that data are inadequate and that sufficient information has not been given to draw a conclusion. However, the given inference appears to be in

sync with the general 'tone' of the passage In such case you may go for 'Probably true'.

To get rid of this confusion, recheck your general mental ability. You can declare the given inference as probably true, if with the help of some extra assumption, the given inference seems likely to be true. Thus, you can some how convince yourself that the inference is likely to be true. On the other hand, you can declare that data are inadequate if no definite conclusion can be drawn from the passage even with the help of some extra assumption. Hence, in such case you can get convinced that the inference is likely to be true or false.

4. **Data inadequate or probably false:** When the given inference is drawn indirectly from the passage, such confusion may arise. As it is not explicitly said in the passage, you come to the conclusion that data are inadequate because sufficient information has not been provided to draw a definite conclusion. However, the given inference appears to you in contradiction with the general 'tone' of the passage. Therefore, you are tempted to pick up 'probably false' as your answer.

To get rid of this confusion recheck your general mental ability. You can declare an inference probably false. Only if you are able to find out a reasonable assumption, combining which with what is said in the given passage the inference appears likely to be false.

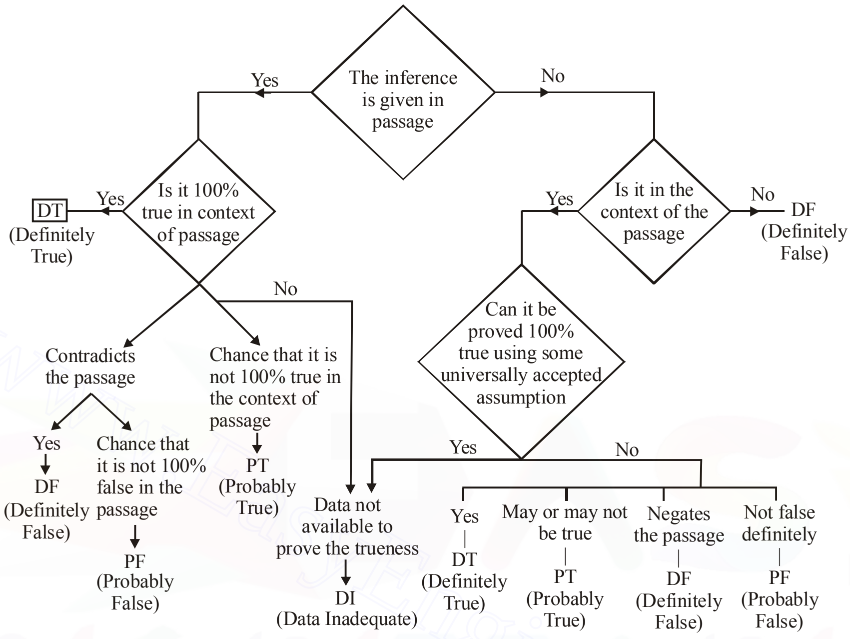
Thus, somehow, you can convince yourself that the given inference is likely to be false. On the other hand, you should pick up the choice 'data are inadequate' only if you can not find any acceptable assumption which, combined with what is said in the passage, may lead to some definite conclusion. In such case, you can not get convinced whether the given inference is likely to be true or false.

Now, lets try to apply the above rules in the passage given above and try to solve the sample problems.

Solution to sample problems:

1. (c) As we have no information about how the freed up land will benefit the common public, hence data inadequate' will be our correct answer choice. The passage do not suggest us any related assumption.
2. (e) The passage says to the contrary getting rid of slums would "Free up ..... valuable government land". The inference does not follow from the passage.
3. (b) The extra assumption that makes this option probably true is : Low productivity is likely to lead to low income. The passage does not directly talk about per capita income.
4. (b) As slums have led to a lower GDP growth in India. The statement is in sync with the 'tone' of the passage. The extra assumption here can be that as countries develop they need to deploy things that improves their GDP. So it can be probably true that all slums vahish.
5. (a) The passage says that the slums dwellers are susceptible "to poor health conditions". This is directly mentioned in the passage.

❑ Shortcut Approach



ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-164-169
Chapter Test	–	C-49- 50
Past Solved Papers		

Chapter 26

Statement & Arguments

INTRODUCTION

In this chapter, we are going to study arguments. In fact, this is the study what we call the basics of all logic. Do you know what do we do in logic? In logic, we advocate certain point of view with the help of some evidences and certain assumptions and that is called argumentation. This is a fact that almost all segments of analytical reasoning are someway associated with argumentation and this is the reason why study of argumentation is so important for the examinees preparing for various competitive examinations.

Concept of Argument

A sequence of two or more sentences (or statements)/ phrases/clauses that includes a conclusion (or claims), is called an argument. This conclusion of the argument is based on one or more than one statement and these statements may be called premises (propositions). Apart from this, arguments may also have some hidden premises. which may be called assumptions. Let us see the following example:

Example:

Mr. Sharma bought a large quantity of sweets, he must have celebrated some occasion.

Explanation: The foregoing example has two parts:

Part I: "Mr. Sharma bought a large quantity of sweets."

Part II: "He must have celebrated some occasion.

Here, 'Part II' is the conclusion part of the given argument. How has this conclusion (part II) been arrived at? In fact, this conclusion has come out with the help of supporting evidence or premise that is part I of the argument. Did you notice that in this argument part I and part II (Premise and conclusion) are connected by a hidden premise which is not explicitly stated. That hidden premise is "a large quantity of sweets is bought only on occasions" and this premise may be called an assumption. Hence, in reality the given argument has three parts.

Part I: (Premise) Mr. Sharma bought a large quantity of sweets.

Part II: (Assumption or hidden premise) a large quantity of sweets is bought only on occasions.

Part III: (Conclusion) He must have celebrated some occasion.

Point to be noted is that part II is an assumption (a hidden premise) that connects part I (premise) and part III (conclusion) and hence, it is a missing link between part I and part III of the given argument.

No doubt that above mentioned example brings to us the basic characteristics of argumentation but it also leaves some questions before us like:

(i) Is the assumption or hidden premise always present in an argument?

(ii) Is the number of premise only one in an argument?

Our answer for both the questions will be a big 'No'. Why so? Let us see the explanations for both the questions given below:

(i) **Explanation for question:** Just consider an argument given as "Mr. Sharma bought a large quantity of sweets. A large quantity of sweets is bought on occasions only. Hence, he must have celebrated an occasion".

Here, we see that this argument has no assumption (hidden premise) because the premise or supporting evidence (Mr. Sharma bought a large quantity of sweets) and conclusion (Hence, he must have celebrated an occasion) are connected by an explicit statement (A large quantity of sweets is bought on occasions only). Remember, an assumption is a hidden premise. It does mean assumption is a missing link in the chain of logic. Therefore, if an argument is complete in itself and does not have any missing link, then it will not have any assumption. In the given argument, the explicit statement (A large quantity of sweets is bought on occasions only) connects premise or supporting evidence and conclusion to make the argument assumptionless.

(ii) **Explanation for question:** Just consider the argument given as "Vandana is tall. She is slim and has beautiful eyes. She has long hair and charming face as well. So, Vandana is a beautiful girl."

Here,

1st premise: Vandana is tall.

2nd premise: She is slim and has beautiful eyes.

3rd premise: She has long hair and charming face as well.

Conclusion: So, Vandana is a beautiful girl.

This proves that an argument can have more than one premises. Further this explanation is also a reply for question (i) as the given argument has no missing link. This argument is complete in itself and hence, it is free of hidden premise or assumption.

Ways of Argumentation: So far, you must have understood the basic concept of argumentation and come to the conclusion that an argument is usually made to make strong a particular point of view in order to convince someone about something.

(i) **Argument based on Analogy:** Analogy based arguments are often used to make strong a particular point of view. In fact analogy is an inference drawn out of a resemblance between particular things, occasion or events (that are known) to a further (unknown) resemblance. For example, if we find a fat-woman eating very much and meet in another woman who is also fat then, by analogy, we expect that the other fat woman would also be eating very much. We can say it in another way that if x, y, z, q are any entities and u, v, w are any attributes

then the analogical argument may be represented in the following form :

x, y, z, q all have the attributes 'u and v'

x, y, z have the attribute 'w'

$\therefore$ q probably has the attribute 'w'

EXAMPLE 1. Sachin scored a century in the 1st test against Australia and so did Dhoni; Sachin scored more than 150 runs in the 2nd test against Australia and so did Dhoni; Sachin has scored a double century in the 3rd test against Australia. So, Dhoni will also hit a double century in this 3rd test match against Australia.

EXAMPLE 2. Australia and England have both lost to India in football and hockey. So, India should defeat both the countries in cricket.

Findings:

In Example 1, Sachin and Dhoni performed very well in the 1st two matches against Australia. In fact, it seems that Dhoni did the same thing what Sachin did in the 1st and 2nd test. As Sachin has played a great inning scoring a double century in the 3rd test match, hence on the basis of similar situation the conclusion has been made that Dhoni will also make a double century.

We also know that performing good or bad is a matter of chance. It is also a matter of chance that two players (Sachin and Dhoni) performed equally good in the last two test matches. Therefore, we cannot say definitely that Dhoni will make a double century because Sachin has done so. In fact, we can say that he may or may not hit a double century. It can also be said that future performances can not be predicted on the basis of past performances. Thus, it is clear that this analogical argument does not seem strong. Similary, in case of example (2) we can say that India may or may not defeat Australia and England in the game of cricket only because India has defeated both the countries in two different games (Football and Hockey). Hence, the argument given in example (2) also seems to be a weak argument.

Final comment: Analogy based arguments are weak arguments.

(ii) **Argument based on cause:** Such arguments relate a cause with a result. Let us see the examples given below:

EXAMPLE 1. India will win the world cup 2011 because it is the most balanced one day team in the world in present day cricket.

EXAMPLE 2. He came back home late night. He must have gone to watch a movie.

Findings: We see in the foregoing examples that effects have been related with causes. In example (1), the cause (the most balanced one day team) well supports the effect (India will win the world cup) and hence, it is a good argument. But in Example (2) it is argued that since the effect (coming home late night) has taken place, the cause (watching movie) must have occurred. But the point to be noted that effect may occur (he may come home late night) because of the other reason as well. Hence, the argument given in the Example (2) is not a good argument or it may be called a weak argument.

Final Comment: Arguments based on causes may be strong or weak or fallacious.

(iii) **Argument based on example:** Sometimes an argument is given by citing some example/ examples as premise/ premises. Let us see the following examples that will illustrate the concept:

EXAMPLE 1. We should use *X* brand of cold cream because *X* brand is used by 'Madhuri Dixit", the famous bollywood actress.

EXAMPLE 2. We must like Roses because Chacha Nehru loved Roses.

Findings: In example (1) we have arrived at the conclusion (we should use *X* brand of cold cream) by using the premise as example (*X* brand is used by Madhuri Dixit). In example (2) the conclusion (we must like roses) has come out by using the premise as example (because Chacha Nehru loved it). Here, we can say in case of Example-1 that using certain brand by a particular actress, does not mean that *X* brand will be liked by all people as likes and dislikes are the personal choices. In example (2), the case is also the same. Everyone cannot like the roses only because Chacha Nehru loved roses.

Final comment: Example based arguments are either weak or fallacious.

Note: In Example-1 and 2, conclusion part is the start of the arguments. Sometimes you can also see that conclusion is given in the middle. It does mean that conclusion part is not always in the last. But it depends on the style of writing of different writers/authors.

(iv) **Argument based on blind advocacy:** Such argument is like a salesman's argument who argues only for the purpose of selling a particular product. He speaks of the advantages and the benefits of his product. Hence, a salesman argument is one where a conclusion comes out because of the positive points and the benefits that it leads to. Such types of arguments are very common in day to day life.

EXAMPLE 1. Exercise is good for health and students need good health to put hard labour in their studies. This is the reason why every educational institution must have a gym.

EXAMPLE 2. There should be a ban on strikes as they disrupt the normal life of the common people.

Findings: In example-1, the conclusion is that every educational institution must have a gym because exercise is good for health and students need good health. No doubt the good health ensures good mind but it is not practically feasible for every educational institution to have a gym. Hence, Example-1 will be a weak argument. In example-2, ban on strikes is being demanded and this demand is reasonable as argument has negative feature of strike. Hence, example-2 is a strong argument.

Final comment: Such arguments can be both weak or strong.

(v) **Argument based on chronology:** Very often we see that a conclusion is drawn only on the basis of chronological order of some events. Let us see the examples given below:

EXAMPLE 1. Computer was invented later than television. Therefore, television has a technology inferior to that of a computer.

EXAMPLE 2. Song 'B' was released two months earlier than song 'C'. So the former could not be the copy of the latter.

Findings: In example-1, it is assumed that a technologically inferior object always comes before the superior objects. This may be true most of the time but this is not true in 100% cases. Hence, the conclusion given in example 1 is questionable making the given argument a weak one. In 2nd case, it is the possibility that song 'C' was recorded earlier although released later than the song 'B'. Hence, in such a situation the possibility of copying can not be denied and this makes argument given in Example-2 a weak argument.

Final comment: This type of arguments are usually weak and unconvincing.

By now, all the standard ways of argumentation have been discussed in detail. We will now take a look at the key words so that you could easily take out the conclusion part from the given argument. The keywords are given below:

So,	**Hence,**
Therefore,	**Consequently**
Thus,	

Apart from above given keywords, the conclusion part can also be identified by the certain phrases given below:

As a result
It can be inferred that
Which means that
Which suggests that
Which proves that
Which shows that
It follows that

If you find one of these keywords/ phrases before any sentence then take that sentence as your conclusion. If the keywords/phrases are absent, then apply your common sense and take out the sentences that can follow one of these keywords/ phrases and that sentence will be your conclusion.

After learning concept of argument we can easily move on to the problems of reasoning which are asked in various exams wherein examinee is required to evaluate the forcefulness of the arguments. On the basis of a statement, arguments are given in the questions and the candidate is required to find out:

(a) Which argument is strong.

(b) Which argument is weak.

We know that "strong" arguments are those which are both important and directly related to the question. "Weak" arguments are those which are of minor importance and also may not be directly related to the question or may be related to a trivial aspect of the question. To find out if a given argument is strong or not we will move according to the solution steps given below:

Solution steps

Step I: Do the preliminary screening of the given arguments.

Step II: Find out if the given arguments really follow or not.

Step III: Find out if the given arguments are really desirable (in case of positive argument) / harmful (in case of negative arguments)

Step IV: Find out if the argument and suggested course of action are properly related.

Now, we will discuss all the steps one by one.

Step I: Preliminary screening of the given arguments

At the very 1st level we test how weak an argument is. If at the very 1st level we find the argument weak, then there is no need to go for further steps. In many cases the weak arguments are very clearly visible and we do not need to think much before arriving at the conclusion that they are weak. Such type of arguments come under the following category:

(i) **Doubtful/Ambiguous arguments:** These arguments do not make it clear that how they are related to a course of action. They also do not give the clear idea about what exactly the author or writer wants to say.

EXAMPLE 1.

Statement: One should enjoy every second of one's life because everyone has to die one day.

Argument: No, because one must think about fulfilling one's ambition in life and should not think about death as one's goal.

Comment: Here, statement and argument are not properly related. Statement suggests to enjoy every second of life. Enjoying life does not mean that one should not follow the path of fulfilling one's ambition. In fact a person can enjoy his/ her life in the course of fulfilling his/her ambition. In fact, we can say without enjoying work of our own choice, we can not fulfill our ambition. Further the given statement does not give any indication that one should see death as one's goal. Hence, in this case statement and argument leave doubtful and confusing impression on our mind making the given argument very weak.

(ii) **Useless/ superfluous arguments:** Such arguments do not do a deep analysis of the given statement. They simply 'glance' at the statement and put them under the category of weak arguments.

EXAMPLE 2.

Statement: Cricket must be banned in India.

Argument: Yes, it has no use.

Comment: Here, the argument does not go deep down into the matter making itself a weak argument.

(iii) **Arguments in the form of question:** Such arguments are very weak in nature as the arguments given in the question form are without any substance and have no technique of argumentation. In fact, in such arguments arguers throw back the question.

EXAMPLE 3.

Statement: Should import be banned in India?

Argument: Yes, why not?

Comment: Here, statement is given in the form of question and arguer throws back the question without giving any convincing statement in the form of argument. Hence, the given argument is very weak.

(iv) **Very simple arguments:** Such arguments are very simple in nature. They are given in small sentences but do not get any support by facts or established notions. Further, such arguments are not ambiguous and they are properly related with the

statement but because of their simple nature they come under the category of weak arguments.

EXAMPLE 4.

Statement: Enjoying life should be the principle of our life.

Argument: No this thinking hardly enable us to do anything.

Comment: Here, the given argument is only a simple assertion which contains no substance. Here, it will come under the category of weak arguments.

Step II: Finding out if the given arguments really follow or not.

If the arguments are rejected at the preliminary step then we do not need to test them further. But, if the preliminary step has been cleared, then we move on to step II.

Case I: When the result follows

At the step II, the result will follow in the cases given below:

(i) **Established fact:** An established fact does mean that it must be universally acknowledged/ scientifically established. A result will follow a course of action if it is an established fact that this particular result follows this particular course of action.

EXAMPLE 1.

Statement: Should drinking be avoided?

Argument: Yes, it contributes to bad health.

EXAMPLE 2.

Statement: Should Tendulkar be selected in the team even after 10 years from now?

Argument: Yes, Tendulkar is one of the greatest cricketers in the world.

EXAMPLE 3.

Statement: Married people should live separate from their parents.

Argument: Yes, living separate will give married people a greater freedom.

EXAMPLE 4.

Statement: Should smoking be promoted?

Argument: No, smoking is injurious to health.

Comment: In the above examples, all the given arguments are expected to follow as they all are established facts. Therefore, all the arguments presented can be said to pass the test of step II.

NOTE : *Point to be noted that arguments given under Example 1, Example 2, Example 3 & Example 4 have passed the step II only so far but it has not yet been determined whether these arguments are forceful or not (strong or not). They will be called strong only when they will pass step III and step IV.*

(ii) **Prediction on the basis of experience:** Such arguments are very near to established facts type of arguments. But, in reality, they are not established facts as they are not yet so universally acknowledged as to be treated as established fact. In fact, such arguments are given on the basis of experiences. Just see the following example:

EXAMPLE 5.

Statement: Captains should not have given their say in selection of national sports teams.

Argument: Yes, it discourages favouritism towards some particular players.

Comment: The result or consequences given in this example will be a probable result as our experiences suggest this. Hence, this will go for further test.

(iii) **Logically given arguments:** Such arguments are given on the basis of logic. It does mean that the emphasis here is on the logic and not on the

established fact or experience. If we see such type of arguments we can easily predict that such cases have occurred in practice. But when we think over such situations with proper logic and reasoning then we arrive at the conclusion that such an argument may be true. Let us see the example given below:

EXAMPLE 6.

Statement: World leaders must try for complete disarmament.

Argument: Yes, complete disarmament will make a war free world.

Comment: The example gives an argument that is logically convincing: The argument is probable as the logic behind it is that if there will be armless world then there will be a war free world. Hence, the argument passes the step II test and will go for further test.

(iv) **Notions of truth:** Such arguments are unquestionable truth because of the simple reason of universal acceptance. It does mean that they are the ideas or thoughts already acknowledged by society. This is the reason why they are very similar to established facts in many ways. The following example illustrates this point:

EXAMPLE 7.

Statement: Should marriages between blood relatives be promoted?

Argument: No, it will promote incest which is a sin.

Comment: No, doubt, the given argument seems strong as it is based on prevailing notion of truth that our society does not allow marriages between blood relatives and consider such marriages as a sin. As, the given argument is likely to be strong it will go for next step test.

Case II (When the result does not follow argument will be rejected).

Following are the cases when results do not follow and arguments are rejected at 2nd level test in step II only.

(i) **Established fact:** If it is an established fact that a particular result will not follow a particular course of action, then the argument will be rejected at step II. Let us see the example given below:

EXAMPLE 8.

Statement: Should smoking be discouraged in the country?

Argument: No, it give relaxation when one gets tired and this way contributes to health.

Comment: It is an established fact that smoking is injurious to health and thus, we can say that this argument is incorrect and weak enough to be rejected at step II.

(ii) **Prediction on the basis of experiences:** If the experiences say that the result will not follow then the given argument will be rejected at the step II. Let us see the example given below:

Statement: Should cricketer A be appointed the next captain of the Indian cricket team?

Argument: Yes, it will end the favouritism in selection of team as cricketer A has made allegations of favouritism against the current captain.

Comment: In this example, the argument suggests that cricketer A should be appointed captain of the Indian cricket team because it will end the favouritism in the team selection. This suggestion has been given on the basis that A has

made allegation of favouritism against the current captain. But the experiences say that there have been so many cases when people did the things what they opposed. Hence, saying one thing and doing other is very common. This is the reason why it can not be made sure that A will not do favouritism in team selection only because he has criticised the current captain for this. It is clear that the given argument is weak enough to be rejected in step II.

Note : *This is the exactly opposite to point (ii) in step II (Case I).*

(iii) **Argument with faulty logic:** This is exactly opposite to the point (iii) in step II (case I). Let us see the following example:

Statement: Should the culprits behind the fodder scam in Bihar be punished?

Argument: No, a political vaccum will be created if the culprits get punishment.

Comment: As per the logic, punishing culprits behind the fodder scam in Bihar would please the public and improve the image of the Bihar government. How can it create a political vaccum? This argument has been given with a faulty logic and hence will be rejected in step II only.

(iv) **Argument violating prevailing notions of truth:** Argument that violates unquestionable notions (Ideas that are universally accepted and acknowledged by society) will be rejected in step II. Let us see the example given below:

Statement: Should marriage in blood relations be promoted in India?

Argument: Yes, if the two mature blood relatives are willing to do so, then they can not be prohibited from doing it.

Comment: In our society, it is widely accepted truth (or universally accepted truth) that the marriages between blood relatives are considered to be a sin as it promotes incest. The given argument violates this prevailing notion of truth and is weak enough to be rejected in step II.

(v) **Arguments based on examples/ analogies:** Very often it is seen that an example or a precedent is made the basis of an argument. But point to be noted that analogy or example based arguments come under the category of bad arguments. It must be cleared that just because someone did something in the past, the same can not be said as pursuable. Let us see the example given below:

Statement: Should everyone be optimistic in Life?

Argument: Yes, Indira Gandhi was optimistic and this is the reason why she became the prime minister of India.

Comment: Here, the example of Indira Gandhi is given that makes the argument very weak. Thus, such type of arguments are rejected in step II.

(vi) **Arguments based on individual perceptions (or assumptions):** In some cases it is seen that an assumption or view of the author is the substance of an argument. Such arguments neither have proper logic nor substance of established fact. These arguments are called bad arguments and they can be rejected in step II.

Statement: Should India be declared a Hindu Rashtra?

Argument: No, it will lead to chaos.

Comment: What message author gives through the argument is view of the

author. In fact, declaring India a Hindu Rashtra may or may not lead to the result given in the argument. It means that assertion made by argument may or may not follow in actual practice and if the author has a rigid stand on this assertion, it is his/ her individual perception or assumption which makes the argument weak enough to be rejected in step II.

Step III: Given arguments are really desirable/ harmful

In step II, we come to the conclusion that Examples 1-7, have passed the 2nd level test and qualified for the step III (3rd level test). Hence, we will take the examples to be qualified for step III one by one:

EXAMPLE 1. Here, the argument is positive and therefore, we have to check the desirability. As, it is a established fact that drinking contributes to bad health and thus it is desirable to avoid it. It is clear row that Example 1 passed the 3rd level test.

EXAMPLE 2. No doubt that at present Tendulkar is one of the greatest cricketers in the world. He will also remain in the list of great ones in the history of the game of cricket. But it is also a truth that he has spent more than 20 years in this game and is a retired cricketer. This is the reason that after 10 years he will definitely not be in team as his selection is impossible. Hence, despite being an established fact the argument is not desirable and is rejected in step III. (Example 2 is a weak argument)

EXAMPLE 3. Here, it is true that living separately from parents gives married people more freedom but at the same time getting freedom at cost of separation from parents is undesirable. Further, separating from parents does mean avoiding duty of taking care of parents. Hence, argument given in example 3 is not desirable and is weak enough to be rejected in step III.

EXAMPLE 4. As smoking is injurious to health, its promotion is harmful. This reason makes the argument strong enough to pass the step III test.

EXAMPLE 5. It is true that favouritism takes place on the part of captains at times, but that does not mean that they should not be given their say while selecting team. In fact, captains are expected to bring positive and desired result if given their say in team selection. Further, giving their say in team selection makes the captains more responsible for the bad performance of the team and this inspires the captain to draw best out of the players in the team. Hence, the result is not desirable and the given argument proves to be weak enough to be rejected in step III.

EXAMPLE 6. If it is possible to make world free of wars through complete disarmament, it is well and good. But, complete disarmament does not assure that there would be no antisocial elements like murderers, looters, terrorists and the likes. To tackle these kind of anti-social elements, police and different security forces are needed. How do police and other security forces function without arms? No, doubt, it is impossible for such security providing bodies to work without arms. Hence, the argument given in Example 6 is weak and will be rejected in step III.

EXAMPLE 7. Marriages in blood relatives promote incest which is a sin and hence harmful for the established norm of society. On the basis of this logic, argument given in Example 7 is strong enough to pass the 3rd level test step III.

Now, we have,

Examples qualified for step IV test: Example-1, 4 and 7. Rejected examples in step III: Example- 2, 3, 5 and 6.

***Note :** How to decide a positive argument which is really desirable or a negative argument which is really harmful, is only the matter of common sense. Just apply your common sense, think over the argument, try to go by proper logic and general norms of society.*

Step IV: Finding proper relation between argument and suggested course of action.

What does proper relation between statement and argument mean? In fact, it does mean that argument must be pinpointed on the main issue involved and it should not focus on any irrelevant, insignificant or minor issues. Now, we move on to step IV or final test. As Example-1, 4 and 7 have qualified for this test, let us check the three examples one by one:

EXAMPLE 1. Drinking and bad health are properly and directly related. Hence, the given argument "Yes, it contributes to bad health" is a strong argument and this is the final conclusion.

EXAMPLE 2. Smoking and bad health (injurious to health) are directly and properly related. Hence, the given argument "No smoking is injurious to health" is a strong argument and this is the final conclusion.

EXAMPLE 3. Marriages in blood relatives and promotion of incest is directly and properly related. Hence, the given argument "No, it will promote incest which is a sin" is a strong argument and this is the final conclusion.

Now, we have come to the end of this chapter. For the understanding of students, below is given a question format the for the examination. The question format has been made with the Example 4 given in this chapter.

Question format:

Direction: Each question given below is followed by two arguments numbered I and II. You have to decide which one of the arguments is a 'strong' argument and which is a 'weak' argument.

Give answer (a) If only argument I is strong.

(b) If only argument II is strong.

(c) If either I or II is strong.

(d) If neither I nor II is strong.

(e) If both I and II strong.

Statement: Should smoking be promoted?

Argument: I: No, smoking is injurious to health.

II: Yes, why not?

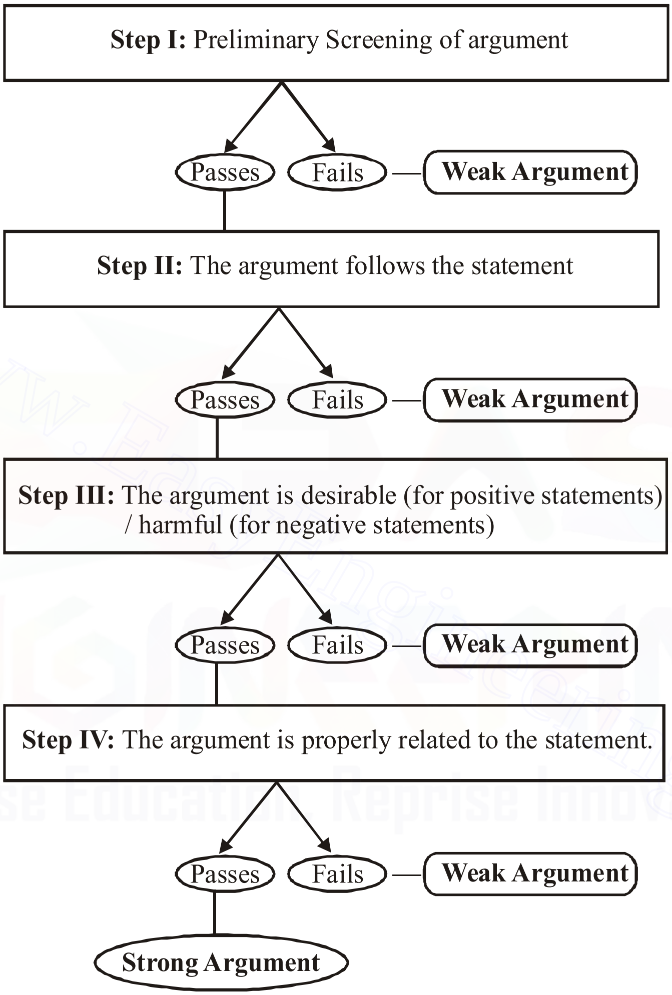
Solution:

I will follow (the reason already given see Example 4)

II will not follow as it is a question back type of argument and such type of arguments are very weak.

Hence, option (A) is the correct answer.

❑ Shortcut Approach



ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-170-177
Chapter Test	–	C-51-52
Past Solved Papers		

Chapter 27

Statement & Assumptions

INTRODUCTION

Assumptions are essential part of analytical reasoning. This is the reason why in various competitive examinations, examinees are asked to identify assumptions. In this chapter, we will see how to identify assumptions. Before we go ahead, we must have a look at a common format of the problem as it will give you a clear idea of the questions to be asked in the examination.

PROBLEM FORMAT (SAMPLE PROBLEM)

Directions: In every question given below a statement (or a passage) is followed by two assumptions number I & II. An assumption is something supposed or taken for granted. You have to consider the statement and the following assumptions and then decide which of the assumptions is implicit in the statement.

Mark answer:

(a) If only assumption I is implicit.
(b) If only assumption II is implicit.
(c) If either assumption I or assumption II is implicit.
(d) If neither of the assumption is implicit
(e) If both the assumptions are implicit.

Statement: "A" television — the largest selling name with the largest range" — an advertisement.

Assumptions:

I. There is a demand for televisions in the market.

II. 'A' television is the only one with wide variations.

The given statement in the problem format is an advertisement. This is the one form of statement. But the statement may be in different forms like it can be in the form of a passage; in the form of a single line; in the form of a notice; in the form of an appeal; in any other different forms.

WHAT DOES AN ASSUMPTION MEAN?

Assumption is the hidden part of an argument. It does mean that an assumption is something which is assumed, supposed and taken for granted. In fact, when a person says something, he does not put everything into words and leaves some part unsaid as why does he ? so?

He does so because he takes this unsaid part for granted. In other words he thinks this unsaid part will be understood without saying and hence there is no need to put this (unsaid part) into words. It does mean this unsaid part is hidden in the given statement and this hidden part is called assumption. Let us

understand it in another way. Just remember your childhood days when you used to solve the given arithmetic problem without leaving any single step. But what you do today? Today your approach is totally different. Today you leave easier steps as you assume that the person who see your solution, is very much aware of these elementary operations. Therefore, this is an example of assumption.

To get the concept of assumption more clearly just suppose a thrilling one day international cricket match is going on between India and Australia. The Australian team has scored 300 runs but while chasing the score India has made 280 runs in 48 overs and now, the situation is India has to score 21 runs to win the match in remaining two overs. As Yuvraj Singh is batting, you tell your friend - "No need to worry as Yuvraj is a big hitter. India will definitely win the match". What do you find in this statement. In fact this statement has two parts:-

(i) No need to worry as Yuvraj is a big hitter.

(ii) India will win the match.

Now, this is the time to think over these two parts. How do you relate them? Obviously, by assuming that a big hitter may score 21 runs in the remaining two overs. Therefore, this is another example of assumption. The above statement can be written in three parts as follows:-

(i) No need to worry as Yuvraj is a big hitter.

(ii) A big hitter may score 21 runs in 2 overs (Hidden part/Assumption)

(iii) So, India will win the match.

Let's get more ideas about assumption with some simple examples given below:-

EXAMPLE 1.

Statement: Of all the mobile sets manufactured in India **'M'** brand has the largest sale.

Assumption: The sale of all the mobile sets manufactured in India is known.

Comment: The given assumption is valid. Here the statement makes a claim that of all the mobile sets manufactured in India, **'M'** brand has the largest sale. In fact, without knowing sale figures may be rough data of all mobile brands manufactured in India, no such claim about M brand could be made. Hence, it must have been implicitly assumed in the given statement that sale figure of all brands is known.

EXAMPLE 2.

Statement: Virat is in great form and therefore, India is going to beat New Zealand in upcoming test series.

Assumption:

I. Virat will give a good performance in upcoming series against New Zealand.

II. Virat will score a triple century in the upcoming series against New Zealand.

Comment: Assumption I is valid as the statement says that Virat is in great form and therefore, India is going to beat New Zealand in the upcoming test series. It does mean that it is assumed in the statement that Virat will perform well in the upcoming test series against New Zealand and on the basis of that good performance India will beat New Zealand. But II is invalid because if Virat is in great form, that does not mean he will surely hit a triple century. He may or may not do so. Hence, assumption II is not hidden in the statement.

EXAMPLE 3.

Statement: The next meeting of the governing body of the society **X** will be held after one year.

Assumption: Institute **X** will remain in function after one year.

Comment: The given assumption is valid as we know that the common practice is to hold meetings of only those bodies that are functional. Hence, it does mean that the announcer must be assuming that the society will remain functional after one year.

EXAMPLE 4.

Statement: The student is too clever to fail in the examination.

Assumption: Very clever students do not fail in the examination.

Comment: This is a valid assumption. As per the given statement the student will not fail (This is an effect) as he / she is very clever (This is a cause). Clearly, it has been assumed in the statement that very clever students do not fail.

HOW DOES A SINGLE WORD OR PHRASE MAKE A DIFFERENCE?

A. Definitive Words Cases:

Just consider the words like 'all', 'only', 'best', 'strongest', 'certainly', 'definitely', etc. These are some words that put a greater degree of emphasis or more weight on the sentence than some others. In fact, these words impart a kind of exclusiveness to the sentence and thereby reduce the scope / range of the sentence. In fact, some kind of certainty is associated with all these words. Let us consider the following examples:

EXAMPLE 5.

Statement: The crisis of onion has worsened and the government should make every effort to boost import of onion.

Assumption:

I. Import is the best solution to avert the onion crisis.

II. Import is a reasonably good solution to the onion crisis.

III. Import is the only solution to overcome the onion crisis.

IV. The onion crisis will definitely be averted by boosting import of onion.

V. The onion crisis will probably be averted by boosting import of onion.

Comment: In the above mentioned example, the assumption II and V are valid. But I, III and IV are not valid. The reason is that there is use of definitive words (best, only and definitely) in case of I, III and IV. The given statement mentions a fact that crisis of onion has worsened and then makes a suggestion that imports of onion should be boosted. In fact the statement assumes that import should help to overcome onion crisis or that import is a good/ reasonably good solution to the onion crisis. But, there is no hint that import is the only solution/ best solution/a definitely effective solution.

Therefore, the example given above illustrates how a definitive word may give a different 'tone' to a sentence.

B. Cases of Conjunctions:

The words like 'because', 'therefore', 'in spite of', 'despite', 'so', 'after', 'even', 'although' 'as', 'as a result of' are some significant conjunctions. When a statement has two clauses and the clauses are connected by a conjunction, then

the nature of conjunction helps in detecting the assumption that the author suggests in his statement. Suppose '*x*' is one clause of a sentence that mention an event (or fact/suggestion) and '*y*' is the another clause of the same sentence which mentions another event (or fact/suggestion), than depending upon the conjunction, we can conclude the following assumption.

(i) ***x* because/ as a result of *y* ⇒ It is assumed that 'y' leads to x.**

EXAMPLE 6.

Statement: You will find improvement in your English after taking classes in institute M.

Valid Assumption: An institute may help in improving English.

(ii) ***x* therefore/ hence *y* ⇒ It is assumed that '*x*' leads to '*y*'.**

EXAMPLE 7.

Statement: Sachin Tendulkar has become the 1st man to score 50th test century, therefore all Indians must be feeling very proud on his achievement.

Valid Assumption: An achievement by a fellow countryman makes other citizens proud.

(iii) ***x* even after/ despite/ in spite of *y* ⇒ It is assumed that usually *x* does not occurs when *y* occurs.**

EXAMPLE 8.

Statement: There was a theft in the city mall last night inspite of the maximum security arrangement made by the police.

Valid Assumption: Maximum security arrangement is usually sufficient to prevent theft.

(iv) **Not '*x*' even after/ in spite of/ despite '*y*' ⇒ It is assumed that usually *x* occurs when *y* does.**

EXAMPLE 9.

Statement: There was no outbreak of any epidemic even after the continuous deposition of rain water for six days.

Valid Assumption: Deposition of rain water usually leads to epidemic.

C. Cases of Connotive Phrases:

Sometimes words used by the author are slightly indirect or unconventional. This is the reason you may miss the thing which the author wants to say. Such indirect or unconventional words are called connotative or connotive phrases. For example "It is true that ...." can be put / written as:

(i) It can be claimed with reasonable degree of truth that...

(ii) It would be correct to say that...

(iii) Even the most sceptic of men would agree that....

Similarly, "It is false" is put / written by the author as :

(i) It is baseless to say that ...

(ii) It would be highly misleading to say that....

(iii) Nothing could be farther from truth than...

Note: The role of connotative phrases is very limited in the questions asked because they are given so that they do not escape your eyes whenever one come across them.

Conditions for Invalidity of Assumptions:

(a) Restatement

If the given assumption is a restatement of the given statement, then the given statement will be invalid. In fact, in such case, same thing is put in different words.

EXAMPLE 10.

Statement: Of all the computer brands, manufactured in India, brand M has the largest sale.

Invalid Assumption: No other brand of computer has as high a sale as brand M.

(b) Long-drawn Conclusion: If an assumption makes too far fetched logic or long drawn conclusion, then it will be considered as invalid assumption.

EXAMPLE 11.

Statement: All teaching should be done in religious spirit as religious instruction leads to a curiosity for knowledge.

Invalid Assumption: Curious persons are good persons.

(c) Observation : It is slightly different from the restatement case. In such case, two of the trio (Subject, verb, predicate) are changed into negative that changes the appearance of the sentence without changing its meaning.

EXAMPLE 12.

Statement: Beauty is lovable.

Invalid Assumptions :

I. Ugliness is not lovable

II. Beauty is not hateable

(d) Conversion : When you study the chapter of syllogism, you see that statements are converted to get immediate inference. In fact, there are three standard cases of conversion:

(i) All M are N, converted into Some N are M.

(ii) Some M are N, converted into Some N are M.

(iii) No M are N, converted into No N are M

Points to be noted that given assumptions will be invalid if they are conversions of the given statements.

❑ ***Shortcut Approach***

Assumption will be implicit if	Assumption will not be implicit if
• it is in context of passge	• not in context of statement or passage
• it is not directly mentioned	• it is directly mentioned in the statement
• it is a mandatory factor condition for the statement to be correct.	• it is not an accepted fact or cannot be truly inferred
	• there is use of definitive words
Note : *The assumption must follow all the above rules for it to be implicit.*	• it is a restatement or a long-drawn conclusion or negative rephrasing or a converted syllogism form.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-178-187
Chapter Test	–	C-53- 54
Past Solved Papers		

Chapter 28

Statement & Conclusions

INTRODUCTION

In this type of questions, a statement is given followed by two conclusions. We have to find out which of these conclusions definitely follows from the given statement.

WHAT IS A 'CONCLUSION'?

'Conclusion' means a fact that can be truly inferred from the contents of a given sentence. Conclusion is the art of judging or deciding, based on reasoning.

DIRECTIONS (for Examples 1 to 3) : In each of the following questions, a statement is given followed by two conclusions I and II. Give answer :

(a) if only conclusion I follows;
(b) if only conclusion II follows;
(c) if either I or II follows;
(d) if neither I nor II follows;
(e) if both I and II follows;

EXAMPLE 1.

Statement : The oceans are a storehouse of practically every mineral including uranium. But like most other minerals, it is found in extremely low concentration – about three gms per 1000 tonnes of water.

Conclusions :

I. The oceans are a cheap source of uranium.
II. The oceans harbour radiation hazards.

Sol. (d) I can not be concluded as most of the minerals are available in similar concentration levels in oceans. II is out of context of the sentence.

EXAMPLE 2.

Statement : Today, out of the world population of several thousand million, the majority of men have to live under government which refuses them personal liberty and the right to dissent.

Conclusions :

I. People are indifferent to personal liberty and the right to dissent.
II. People desire personal liberty and the right to dissent.

Sol. (b) It is mentioned in the statement that most people are forced to live under governments which refuse them personal liberty and right to dissent. This means that they are not indifferent to these rights but have a desire for them. So, only II follows.

EXAMPLE 3.

Statement : It has been decided by the Government to withdraw 33% of the subsidy on cooking gas from the beginning of next month—a spokesman of the Government.

Conclusions :

I. People no more desire or need such subsidy from government as they can afford increased price of the cooking gas.
II. The price of the cooking gas will increase at least by 33% from the next month.

Sol. (d) I does not follow because a govt's policy is not determined merely by people's needs.

II does not follow. Let the present price be x

$\therefore$ Price if subsidy is removed

$= \frac{x}{0.67} = 1.49x$

Hence increase in price will be around 49%

DIRECTIONS (for Examples 4 to 5) : In each of the following questions, a statement is given followed by two conclusions I and II. Give answer :

(a) if only conclusion I follows;
(b) if only conclusion II follows;
(c) if either I or II follows;
(d) if both I and II follow.
(e) if neithter I nor II follows;

EXAMPLE 4.

Statement : Interest rate will be fixed on the basis of our bank's rate prevailing on the date of deposit and refixed every quarter thereafter.

Conclusions:

I. It is left to the depositors to guard their interest.

II. The bank's interest rates are subject to change on a day-to-day basis depending on market position.

Sol. (b) I does not follow because the statement is silent about the depositors. II follows from the phrase "bank's rate prevailing on the date of deposit" which means the rates are subject to day-to-day changes.

EXAMPLE 5.

Statement : The government of country X has recently announced several concessions and offered attractive package tours for foreign visitors.

Conclusions :

I. Now, more number of foreign tourists will visit the country.

II. The government of country X seems to be serious in attracting tourists.

Sol. (e) Clearly, the government has taken the step to attract more tourists. So, both I and II follow.

❑ Shortcut Approach

For a adhere conclusion to follow a statement must to the following **4 GOLDEN RULES.**

1. The conclusion must be in context of the statement. If out of context than it does not follow.

2. The conclusion must support the contents of the statement. If it negates than it does not follow.

3. The conclusion must be truly inferred. If there is some doubt that it may or may not be correct or truly inferred, than it does not follow.

4. The conclusion must not repeat or rephrase the statement. If so, it does not follow.

Now let us apply these rules to the 5 examples solved above.

Ex.1 I. Rule 2 applies as it negates the statement.

II. Rule 1 applies as it is out of context.

Ex.2 I. Rule 2 applies as it negates the statement.

II. Fulfils all the conditions in Rule 1-4.

Ex.3 I. Rule 1, 2 & 4 follow but 3 does not as there can be various reasons to withdraw subsidy.

II. Rule 1, 2 & 4 follow but 3 does not as the price increase is actually 49%

Ex.4 I. Rule I applies as it is out of context.

II. Follows all the 4 rules perfectly.

Ex.5 Both I & II follow all the 4 rules and hence follow the statement.

ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-188-192
Chapter Test	–	C-55- 56
Past Solved Papers		

Chapter 29

Courses of Action

INTRODUCTION

In many competitive examinations questions related to courses of action are frequently asked.

The basic reason behind asking such questions is to test your ability to judge a problem correctly in order to determine the root of the given problem and then finding out a proper course of action for that particular problem.

What is the format of the problem?

Directions: In the question given below is given a statement followed by two suggested courses of action number I and II. A course of action is a step or administrative decision to be taken for improvement, follow up, or further action in regard to the problem, policy etc. On the basis of the information given in the statement. Read the situation carefully and then decide which of the given courses of action follow/ follows.

Mark answers:

(a) If only I follows
(b) If only II follows
(c) If either I or II follows
(d) If neither I nor II follows
(e) If both I & II follow.

Statement: The sale of a particular product 'A' has gone down considerably, causing great concern to company 'X'.

Courses of action :

I. Company 'X' should mark a proper study of the rival products in the market.

II. The price of product 'A' should be reduced.

NOTE : In the examinations more than two courses of actions may also be given.

Types of Problems

(1) Problems based on problem and solution relationship.
(2) Problems based on fact & improvement relationship.

1. Problems based on problem and solution relationship

This is a case when the given statement talks of a problem and the suggested course of action talks of a solution. It is very easy to find out when a suggested course of action is acceptable and when it is not. In fact, the suggested course of action will be acceptable if:

(a) it solves/ reduces or minimises the given problem
(b) it gives a practical and wise solution.

Now, what to do ? Just see the given problem with a serious eye; think over that; apply your day to day experiences; apply your common sense and use your general knowledge to judge whether a suggested course of action solves or reduces or minimises the problem given in the statement. After this step, the next step is checking the practicality. Here, you have to check if the solution suggested by the given course of action is wise enough and applicable in practical way in day to day life.

Infact (a) is the 1st step test and after passing the step I test, the given course of action will have to pass step II (which is (b)). If the given course of action passes both the tests [step I and step II] only then it will be called a correct action.

Step I test

To pass the step I test a suggested course of action must be

(i) based on an established fact or
(ii) based on logical prediction or
(iii) based on experiences
(iv) based on prevailing notions of truth

Let us discuss all the conditions mentioned above:-

(i) Action based on established fact: -

In some of the cases an action taken is an established fact which suggests that the given problem can be reduced or solved by this particular solution. It does mean that the solution suggested by the given course of action is universally acknowledged to the given problem. Let us see the examples given below:

EXAMPLE 1.

Statement: Southern part of India has been coming rapidly into the grip of malaria.

Courses of action:

I. The Southern Indian population must be instructed not to come out of their houses. [wrong action]

II. Anti-mosquito liquids should be sprayed in the southern part of India. [correct action]

EXAMPLE 2.

Statement: A child was caught while stealing money of a respectable person of society.

Courses of action:

I. The child should be sent to child welfare society. (correct action)

II. The child should be put in jail and severly beaten (wrong action)

Comment: In example I, I is rejected as it is an irrelevant action. It does not make it clear how instructing population for not coming out of their houses will solve or reduce the problem of spreading malaria. But II is a proper course of action as it is an established biological fact that malaria can be prevented by using safeguards against mosquitoes. This is the reason that II will go for further test (step II test) proving itself a proper course of action in 1st level test (step I test).

In example 2, II is rejected on the basis that it is totally illogical to beat a child and put into jail as a child is not mature enough to decide what is right and what is wrong. Further, it is an established fact (socially established fact) that child criminals must not be treated as punishable wrong doer but they should be made to mend their ways and on the basis of this I is the correct course of action. Hence, I will qualify for the 2nd round test (Step II test)

(ii) Action based on logical prediction:

In such type of cases, solutions provided for the given problems are neither an established fact nor they can be considered as proper action on the basis of our past experiences. Hence, in such cases examinees are required to apply certain logic and reasoning to find out if the given course of action solves or reduces or minimises the problem. Let us see the example given below:

EXAMPLE 3.

Statement: Jammu & Kashmir is experiencing, again, the rise of terrorism and it is obvious that Pakistan is encouraging it.

Course of action: India must go to the international bodies with all the proof of Pakistani involvement in Jammu & Kashmir and demand that Pakistan must be declared a terrorist nation. [correct action]

Comment : Here, the given course of action is the correct one at step I test. In fact, it is a matter of simple logic of diplomacy that in case of disturbances created by a hostile nation within our country, we put this issue before international bodies so that the hostile nation stands at disadvantage. Thus Ex. 3 will qualify for the next step test (step II or practicality test).

(iii) Action based on experiences: In certain cases, while deciding if a given course of action solves or reduces or minimises the given problem, our experiences work. In fact, in such cases the given problem may be a relatively new one. It will not be totally new but it will not be very old either. This is the reason that the solution can not be said as an established fact. However, based on our past experiences, in the similar kind of situation, we can reach the conclusion that the given problem can be solved/ reduced/ minimised by this particular action. Let us see the example given below:

EXAMPLE 4.

Statement: Several foreign powers having expansionist thinking are threat to India.

Course of action: Efforts should be made that the Indians remain united for any eventuality. [correct action]

Comment: Our past experiences say that we (India) became a sufferer several times because of the foreign powers and at that time we lacked our unity. In another words, India has fallen victim to foreign powers only when our country (India) has not remained united. Hence, on the basis of our past experience, we can conclude that the given course of action solves or reduces the problem making its entry for 2nd level (step II) test.

(iv) Action based on prevailing notions of truth: In such type of cases solutions provided for the given problem is as per the social norms. In other words, the given course of action suggests a solution that is prevailing notion of truth. In fact, they are the ideas that are universally accepted and acknowledged by the society and hence in many ways they are similar to established fact. Let us see the following examples:

EXAMPLE 5.

Statement: Mr Sharma got angry and beat his son mercilesely.

Course of action : Mr.Sharma should be caned publicly [wrong action]

EXAMPLE 6.

Statement : Most of manufacturing companies in India are running in losses.

Course of action: Prospects of privatisation of these companies must be explored. [correct action]

Comment: In example 5, the given solution is against the societal worm as public beating is not considered a good punishment. In other words, it is prevailing notion of truth that public

beating is not good. Hence, on the basis of this the given solution is rejected and will not go for 2nd level test (step II test). In example 6, the given course of action suggests privatisation for loss making manufacturing companies and no doubts, it is a prevailing notion of truth that privatisation can reduce or minimise their losses. There is also a chance that privatisation can convert a loss making company into a profitable one. Hence, we conclude the given solution is correct one and will qualify for further test (2nd level test or step II test). Now, we can move on to step II test.

Step II (Test of Practicality)

This is the 2nd part of test. In the 1st part we just found out whether a suggested action really solves/ reduces/ minimises the given problem. But an important part also remains to be checked and that is the test of practicality. Point to be noted that a given course of action may solve/ reduce/ minimise a particular problem but if it is not practically possible, it will be consider useless. This is the reason why this point too, needs sound checking. For this you have to keep the following things in your mind:

A. The problem and solution must be well matched and must be in proportion. In other words, if solutions are too simple for too severe problems, they will be useless. Conversly, we can say that too severe solutions are not good solutions for too simple problems.

B. Even after passing the step I test, the given solution is creating a new problem, then the given solution will not be a good solution and will fail in practicality test.

EXAMPLES FOR (A)

EXAMPLE 7.

Statement : Lack of discipline is a good reason for low productivity in India.

Course of action : Government must take step to make military traing compulsory for all Indian citizens. [wrong action]

EXAMPLE 8.

Statement: As per the report of 'WHO' (World Health Organisation) the life expactancy of an average Indian is continuosly declining.

Course of action : A serious effort must be made to prevent children from making noises. [wrong action]

Comment: In Example 7, the given course of action is not a good solution for the given problem. No, doubt that military training wold be a solution for lack of discipline but is it a practical solution? Your answer will be a big 'No' (why?). In reality, at the 1st step test the given course of action may seem true as it solves the given problem but when it comes to the 2nd level test, it becomes clear that it is too severe solution for a relatively small problem. Hence, on this basis the given course of action is rejected finally.

In example 8, the given course of action suggests that problem of declining life expectancy can be solved if children are prevented from making noises. At one stage the given course of action reduces the problem to some extent as it suggests that less noise will increase the chances of low blood pressure and this will result in less deaths. But when we think analytically, we come to the conclusion that the problem is very serious and the given solution is very simple for it. Hence on

this basis the given course of action would be declared a wrong one and would be rejected finally.

EXAMPLE FOR (B)

EXAMPLE 9.

Statement: In recent years, people have developed a tendency of tax evasion and this is the reason it has increased at an alarming level.

Course of action : Government must make law to abolish taxes. [wrong action]

Comment: Here, the given problem is about tax evasion. Tax evasion does mean showing less income to pay less tax. Why tax evasion is a problem? Because tax evasion generates black money. The given course of action suggests the abolition of taxes which connot be a good solution as taxes are taken to provide people certain indirect services like the facilities of roads, parks, police etc. Suppose if taxes are not charged, how and where from money will come to provide such indirect services to community. No doubts, the tax abolition will create a new problem. Hence on this basis the given course of action will be rejected finally as it fails the 2nd level test (step II test) of practicality.

Now after understanding what is a practical solution, we can test the courses of action that have passed the step I test and given under examples 1, 2, 3, 4 and 6.

Step II test of Example 1 (Course of action II):

IInd course of action given under example 1 is "Anti mosquito liquids should be sprayed in the southern part of India". In step II, we need to check if it is a practical solution for the given problem. In the past we have also seen that such steps have been taken. Not in the past only even today whenever it seems that mosquito born diseases are imminent, the anti-mosquito liquids are sprayed. Such step is taken only because it is practical. Here, the IInd course of action given under example 1 passes both the test to be finally declared as proper and correct solution.

Step II test of Example 2 [Course of action I]:

Ist course of action given under example 2 is "child should be sent to child welfare society". In step II, we need to check if it is a practical solution. In so many cases we have seen that when a child does a crime like stealing and some other more serious crime, then they are put under such atmosphere that they can understand the seriousness of their crime and try to mend their ways. For such children, child welfare societies and some other such kind of organisations are very helpful. Hence, this course of action passes its final test to be declared a correct course of action.

Step II test of Example 3 :

The course of action given under example 3 is "India must go to the international bodies with all the proof of Pakistani involvement in Jammu & Kashmir and demand that Pakistan must be declared a terrorist nation" and this is a very practical solution. As we have seen in certain circumstances in past that India has put such type of demand from UNO and even from some other nations on individual basis. No doubts, that on such demands India has got support to some extent. Hence it is a very practical solution and this given course of action passes it practicality test to be declared a proper and correct course of action.

Step II test of Example 4 :

The given course of action "efforts should be made that the Indians remain united for any eventualities" is a practical one as we have shown this type of unity in the past. For example, in the freedom struggle we were united. How this unity took place? Only because this was practically possible. Hence, this given course of action, too, passed the practically test to be declared finally a proper and correct course of action.

Step II test of Example 6:

The given course of action "Prospects of privatisation of these (loss making) companies must be explored is not a correct solution at the end at the 2nd level test (Practicality test) because the course of action and the given statement are not properly linked. The statement does not make it clear that it talks only about public sector manufacturing concerns as even a private sector manufacturing company may be a loss making company. Hence the statement and given course of action creates confusion. Therefore, the given course of action is rejected at 2nd level test.

2. Problem based on fact and improvement relationship

This is the 2nd type of problem related to course of action. But point to be noted is that this does not require any new skill. The solving method is exactly the same as you have solved the 1st type of problem that is problem solution based. In fact you have to solve this type of problem in two steps:

(i) Find out whether the suggested course of action will help in improvement of the situation.

(ii) Find out whether the two are properly balanced.

In fact problem given under example 7 is such type of problem.

Now we have come to the end of this chapter and this is the time to solve the problem given under 'what is the format of the problem'? Let us solve it:

Statement : The sale of a particular product 'A' has gone down considerably, causing great concern to company 'X'.

Courses of action :

I. Company should make a proper study of rival products in the market.

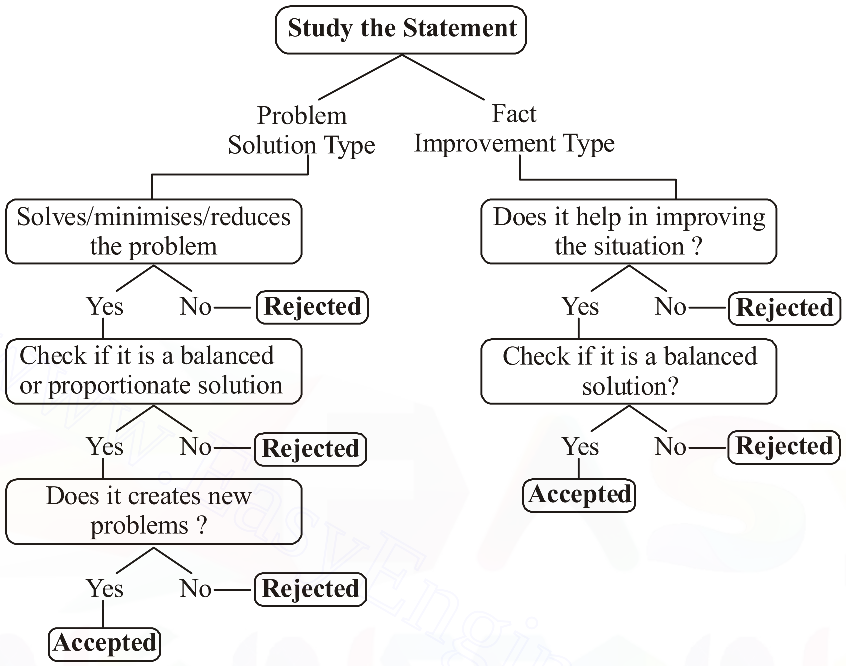
II. The price of product 'A' should be reduced.

Solution. Option (a) is the correct option as only I follows.

Reason /Explanation: If the sale of 'A' has gone down, then there must be some solved reasons. The company X must know this reason. As I suggest the similar solution, it follows. But II does not follow. The company should first know if price was a factor behind the drop in sale. Without knowing this, reducing price may turn out to be a wrong and harmful action.

Note : If you see 'an either choice' in the answer options avoid it. It will be a wrong answer. Either choice can be in the form like "Either of I or II (or III or I etc.) follows".

❑ Shortcut Approach



ebooks Reference		*Page No.*
Practice Exercises with Hints & Solutions	–	P-193-198
Chapter Test	–	C-57-58
Past Solved Papers		

Chapter 30

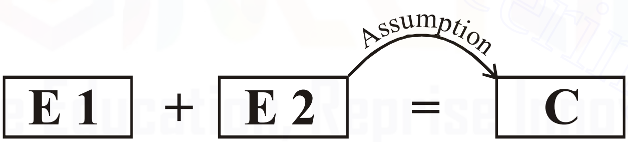
Critical Reasoning

INTRODUCTION

Critical Reasoning (CR) is ability to reason clearly to evaluate and judge arguments. You are using this skill a lot during your everyday life while reading newspapers or watching movies. When you think that the movie is pushing the limit of the Reasonable or the news sounds less reasonable than the movie that was pushing the limit, you are using your Critical Reasoning skills to produce these conclusions. The argument you meet can be anything from a classical argument to an advertisement or a dialog. Critical Reasoning questions will ask you to manipulate the argument to weaken/strengthen it, find the conclusion, assumption, explanation, do an inference or supplement a statement, etc. Whatever it is that you have to do, you will need 2 things to succeed: know the basic structure of arguments and clearly understand the argument.

In general, most of them, arguments consist of evidence, usually 2 pieces, a conclusion - the main point of an argument, and an assumption - the bridge between the evidence and conclusion. The majority of the arguments you encounter on the test will be 3 step arguments:

Evidence 1 + Evidence 2 = Conclusion.



EXAMPLE 1. Last week Mike was detained for shoplifting at a groceries store near his house, but he has been a Christian for 10 years, therefore, the police must have been wrong accusing him in stealing.

Note : There are two pieces of evidence: *'Mike was accused of stealing'* and that *'he is a Christian'*. The conclusion is that **'the police are wrong'**. Therefore, our huge assumption here is that '*a Christian could not have stolen anything.*'

EXAMPLE 2. There are a lot of mosquitoes outside today, please do not turn on the light in the room because a lot of them will fly in.

Note : Here the evidences are *'there are a lot of mosquitoes outside today'* and *'do not turn on the light'*. The conclusion is that '**Many will fly in**' and the assumption is 'mosquitoes will approach the light.'

There is no set scheme for structure in CR, but since the majority of the arguments are only a few sentences long,

the conclusion usually comes in the first or the last sentence. However, some of the arguments encountered will not have a conclusion at all or will have just an implied one.

Strategy to Crack Critical Reasoning Questions

This strategy is not the easiest way to do CR (the easiest would be read-and-answer), but it lets you get the most questions right spending less time per correct answer.

1. Read the questions first; this is needed so that you would know what to look for and what to do: find an assumption, strengthen/weaken, infer something or else; do not worry about the details in the question, read for keywords, such as strengthen, deny, or explain. [Use symbols for convenience, e.g. + for strengthen or – for weaken].
2. Read the passage very attentively because in contrast to Reading Comprehension, there is very little text here and mostly everything is important; try to read only once. Reread if required.
   As you read, look for the problem in the passage (evaluate how convincing it is)
3. Paraphrase (reword) the passage. It is a very important step because when you do a paraphrase, you check whether you understood the passage and at the same time you extract the skeleton of the argument, making it easier to identify the conclusion and the assumption. Very often, the paraphrase of the passage will be pretty close to the conclusion. It is not surprising, since the conclusion is the main point and evidence just supports it.) Your paraphrase should be as close to the text and as simple as possible so that you would understand it easily and at the same time could fully trust it. Do not make it too general nor too detail oriented. When you do a paraphrase, do it in three steps: Evidence1, Evidence2, and Conclusion; put "therefore" word before you start your conclusion, this will help you to set it off.
4. Read the question again (now with more understanding of what is being asked; reading the question 2 times, it will also help you to make sure your answer exactly what is stated and that you understand the question.)
5. Answer before reading the answer choices. There are two reasons for this :
   (i) if you can think of the correct answer or at least the general direction that the answer choice needs to be, you will identify it among the wrong choices much faster, thus spend less time reading the answers, which usually take 30 seconds to cover.
   (ii) Often students are seduced by the author's wording. One reads a few words that were used in the passage and the brain identifies this choice with the passage, thus making it seem more right that it needs to be. The more problems you practice with, the more chance is you will guess the right answer even before reading it.
6. Go through the answers, first time scan them for YOUR answer choice (usually you will guess correctly in 60-70% of cases), if you did not find it, reread them more attentively.

7. Draw a grid to eliminate the wrong answers easier. Use "✓" for a sure answer, "×" for a definitely wrong answer choice, and "?" for an answer that may be right or questionable. This will help to concentrate only on a few answer choices and will prevent you from reading same answers several times if you get confused or keep having troubles locating the right answer.

TYPES OF CRITICAL REASONING QUESTIONS

Critical reasoning questions will ask you to:

1. Identify the inference / Must be true question
2. Identify the assumption.
3. Strengthen an argument.
4. Weaken an argument.
5. Select the best conclusion/Main Point
6. Identify the paradox
7. Evaluation/ Reasoning
8. Identify a parallel argument/Structure.

1. Identify the Inference/Must be True Question

These type of questions are extremely common. An **Inference** means the same thing as "must be true". **Conclusions** differ from **inferences** in that conclusions are the result of premises and inferences are something that must be true. The following are the typical Inference (Must be true) based Questions:

- If the statements above are true, which of the following must also be true?
- Which of the following is [implied, must be true, implicit, most reasonably drawn] in the passage above?
- Which of the following inferences is best supported by the statement made above?

❑ Shortcut Approach

How to tackle "Identify the inference / Must be true questions":

- Read the stimulus and look for the argument.
- Note that Must Be True questions may not contain an argument. They may just be a series of facts. Nevertheless, try to find the argument.
- Avoid choices which contain absolute statements - never, always, none, only etc. Although these words might appear in some correct choice, you should be very sure about them.
- Some of the options can be eliminated as they go beyond the scope of the passage. Note that an inference can be based on only some of the information provided and not the complete passage.

EXAMPLE 1. Stimulus Argument

Increases in funding for police patrols often lower the rate of crimes of opportunity such as petty theft and vandalism by providing visual deterrence in high-crime neighborhoods. Levels of funding for police patrols in some communities are increased when federal matching grants are made available.

Question : Which of the following can be correctly inferred from the statements above?

Options :

(a) Areas with little vandalism can never benefit from visual deterrence.

(b) Communities that do not increase their police patrols are at higher risk for crimes of opportunity late at night.

(c) Federal matching grants for police patrols lower the rate of crimes of opportunity in some communities.

(d) Only federal matching grants are necessary to reduce crime in most neighborhoods.

(e) None of these

Sol.

(c) is a summary of the information provided; it is the logical end of a chain of reasoning started in the stimulus argument. The sequence of events goes like this :

Increased funding → Increased visual deterrence → Lower crime

The last statement could be mapped as follows:

Federal grants → Increased patrol funds

(c) makes the chain complete by correctly stating that federal grants can lead to lower crime in some communities. Now the logical chain becomes:

Federal grants → Increased funding → Increased visual deterrence → Lower crime

The other answer choices may not be correctly inferred because they go beyond the scope of the argument. They may be objectively, factually correct, or they may be statements that you would tend to agree with. However, you are limited to the argument presented when choosing a correct answer.

2. Identify the Assumption

An assumption is an unstated premise that supports the author's conclusion. It's the connection between the stated premises and the conclusion., which together forms the passage. An assumption is something that the author's conclusion depends upon. Assumption questions are extremely common and have types that look like this:

- Which of the following most accurately states a hidden assumption that the author must make in order to advance the argument above?
- Which of the following is an assumption that, if true, would support the conclusion in the passage above?

❑ ***Shortcut Approach***

How to approach "Identify the assumption Questions"

- Look for gaps between the premises and the conclusion. Ask yourself why the conclusion is true. Before you progress to the answer choices, try to get feel of what assumption is necessary to fill that gap between the premises.
- Beware of extreme language in the answer choices of assumption questions. Assumptions usually are not extreme. "Extreme" answer choices usually contain phrases such as always, never, or totally.

EXAMPLE 2. Stimulus Argument

Traditionally, decision making by doctors that is carefully, deductively reasoned has been considered preferable

to intuitive decision making. However, a recent study found that senior surgeons used intuition significantly more than did most residents or mid-level doctors. This confirms the alternative view that intuition is actually more effective than careful, methodical reasoning.

Question : The conclusion above is based on which of the following assumptions?

Options :

(a) Senior surgeons are more effective at decision making than are mid-level doctors.

(b) Senior surgeons have the ability to use either intuitive reasoning or deductive, methodical reasoning in making decisions.

(c) The decisions that are made by mid-level and entry-level doctors can be made as easily by using methodical reasoning as by using intuitive reasoning.

(d) Senior surgeons use intuitive reasoning in making the majority of their decisions.

(e) None of these

Sol.

(a) The correct answer is (a), which provides a missing link in the author's reasoning by making a connection from the evidence: that intuition is used more by senior surgeons than other, less-experienced doctors, and the conclusion: that, therefore, intuition is more effective. None of the other choices helps bridge this gap in the chain of reasoning. Although some of the other statements may be true, they are not responsive to the question. In fact, they mostly focus on irrelevant factors such as appropriateness, ease of application, ability, etc.

3. Strengthen an Argument

Assumptions connect premises to conclusions. An argument is strengthened by strengthening the assumptions. Here are some examples of Strengthen question types :

- The conclusion would be more properly drawn if it were made clear that...
- Which of the following, if true, would most strengthen the conclusion drawn in the passage above?

❑ ***Shortcut Approach***

How to approach "Strengthen an argument"

- Once you have identified the argument of the passage, i.e. the evidence(s) + conclusion, try putting in each option with the argument. Check if the assumption(s) you have drawn is (are) strengthened if you accept the content of the option as true.

EXAMPLE 3. Stimulus Argument

Three years after the Bhakra Nangal Dam was built, none of the six fish species native to the area was still reproducing adequately in the river below the dam. Because the dam reduced the average temperature range of the water from approximately 40° to approximately 10°, biologists have hypothesized that sharp increases in water temperature must be involved in signaling the affected species to begin their reproduction activities.

Question :

Which of the following statements, if true, would most strengthen the scientists' hypothesis?

Options :

(a) The native fish species were still able to reproduce in nearby streams where the annual temperature range remains approximately 40°.

(b) Before the dam was built, the river annually overflowed its banks, creating temporary backwaters that were used as breeding areas for the local fish population.

(c) The lowest temperature ever recorded in the river prior to dam construction was 30°; whereas the lowest recorded river temperature after construction was completed has been 40°.

(d) Non-native fish species, introduced after the dam was completed, have begun competing with the native species for food.

(e) None of these

Sol.

(a) most strengthens the conclusion that the scientists reached. It does so by showing that there is a control group. In other words, a similar population, not subjected to the same change as the population near the dam, did not experience the same type of result. Here the basic assumption about the conclusion that scientists reached is that 'because of the reduction of average temperature range of the water, the reproduction of the native fish species has reduced drastically'. Option (a) clearly strengthens the assumption.

4. Weaken an Argument

Assumptions connect premises to conclusions. An argument is weakened by weakening the assumptions. Here are some examples of Weaken question types:

- Which of the following, if true, would weaken the conclusion drawn in the passage above?
- The argument as it is presented in the passage above would be most strengthened if which of the following were true?

❑ ***Shortcut Approach***

How to approach "Weaken an argument"

- Once you have identified the argument of the passage, i.e. the evidence(s) + conclusion, try putting in each option with the argument. Check if the assumption(s) you have drawn is (are) weakened if you accept the content of the option as true.

EXAMPLE 4. Stimulus Argument

A drug that is very effective in treating some forms of cancer can, at present, be obtained only from the bark of the Raynhu, a tree that is quite rare in the wild. It takes the bark of approximately 5,000 trees to make one pound of the drug. It follows, then, that continued production of the drug must inevitably lead to the raynhu's extinction.

Question :

Which of the following, if true, most seriously weakens the above conclusion?

Options :

(a) The drug made from Raynhu bark is dispensed to doctors from a central authority.

(b) The drug made from the Raynhu bark is expensive to produce.

(c) The Raynhu generally grows in largely inaccessible places.

(d) The Raynhu can be propagated from cuttings and cultivated by farmers.

(e) None of these

Sol.

(d) provides an alternate source of the Raynhu bark. Even though the tree is rare in the wild, the argument is silent on the availability of cultivated trees. The author of the argument must be assuming that there are no Raynhu trees other than those in the wild, in order to make the leap from the stated evidence to the conclusion that the Raynhu is headed for extinction. The option (d) weakens the assupmtion - 'there are limited raynhu trees' - by saying that there are other ways as well for the propogation of Raynhu. The other answer choices all contain information that is irrelevant. Note that the correct choice does not make the conclusion of the argument impossible. In fact, it is possible that there may be domesticated Raynhu trees and the species could still become extinct. Answer choice (d) is correct because it makes the conclusion about extinction less likely to be true.

5. Conclusion / Main Point Question

In Main Point / Conlcusion questions, you have to identify the conclusion of an argument. You are trying to find the author's point and should approach this question in a similar way to the reading comprehension main point questions. They come in several different formats:

- The main point of the passage is that...
- Which of the following statements about... is best supported by the statements above?
- Which of the following best states the author's conclusion in the passage above?
- Which of the following conclusions can be most properly drawn from the data above?

The conclusion of arguments in Main Point questions is usually not directly stated. To find the conclusion, identify the premises and then identify the conclusion drawn from the premises. Main Point questions differ from the other Critical Reasoning questions in that the argument in the stimulus is usually valid. (In most other Critical Reasoning questions the reasoning is flawed.) Conclusion questions require you to choose the answer that is a summary of the argument.

❑ Shortcut Approach

How to approach "Main Point Questions":

- Main Point answers must be within the scope of the passage.
- Your opinions or information outside of the passage are always outside of the scope.
- Some of the options given can be out of the scope of the passage.

- Knock out answers with extreme wording. Main Point answers typically do not use *only, always, never, best* or any strong words that leave little room.

EXAMPLE 5. Stimulus Argument

People should be held accountable for their own behaviour, and if holding people accountable for their own behaviour entails capital punishment, then so be it. However, no person should be held accountable for behaviour over which he or she had no control.

Question : Which of the following is the most logical conclusion of the argument above?

Options :

(a) People should not be held accountable for the behaviour of other people.
(b) People have control over their own behaviour.
(c) People cannot control the behaviour of other people.
(d) People have control over behaviour that is subject to capital punishment.
(e) None of these

Sol.

(b) The correct response is (b). The argument includes the following two premises:
Premise 1: People are accountable for their own behaviour.
Premise 2: People are not accountable for behaviour they cannot control.
Here's the logical conclusion based on these two premises:
Conclusion: People can control their own behaviour.

(a) would require that people never have control over the behaviour of other people. Yet the argument does not provide this premise.
(b) would require that people should not be held accountable for the behaviour of other people. Yet the argument does not provide this premise.
(d) is not inferable. The argument allows for the possibility that a person might not have control over another person's behaviour which is subject to capital punishment.
(e) None of these

6. Identify the Paradox

These questions present you with a paradox, a seeming contradiction or discrepancy in the argument, and ask you to resolve it or explain how that contradiction could exist. In other words, there are two facts that are both true, and yet they appear to be in direct conflict with one another. Here are some examples of the ways in which these questions are worded:

- Which of the following, if true, would help to resolve the apparent paradox presented above?
- Which of the following, if true, contributes most to an explanation of the apparent discrepancy described above?

❑ *Shortcut Approach*

How to approach "Identify the paradox questions"

- Read the argument and find the apparent paradox, discrepancy, or contradiction.

- State the apparent paradox, discrepancy, or contradiction in your own words.
- Use process of elimination. The best answer will explain how both sides of the paradox, discrepancy, or contradiction can be true. Eliminate answers that are out of scope.

EXAMPLE 6. Stimulus Argument

Town Y is populated almost exclusively by retired people and has almost no families with small children. Yet Town Y is home to a thriving business specializing in the rental of furniture for infants and small children.

Question : Which of the following, if true, best reconciles the seeming discrepancy described above?

Options :

(a) The business specializing in the rental of children's furniture buys its furniture from distributors outside of Town Y.

(b) The few children who do reside in Town Y all know each other and often stay over night at each other's houses.

(c) Many residents of Town Y who move frequently prefer to rent their furniture rather than buy it outright.

(d) Many residents of Town Y must provide for the needs of visiting grandchildren several weeks a year.

(e) None of these

Sol.

(d) The correct answer (d), explains why a town of mostly retired residents might need to rent children's furniture. The other answer choices all contain irrelevant information. This further illustrates the fact that, on all question types, if you eliminate the irrelevant choices, the remaining choice will most likely be correct.

7. Evaluation/ Reasoning Based Questions

Reasoning questions ask you to describe how the argument was made, not necessarily what it says. These questions are closely related to assumption, weakening, and strengthening questions. The correct answer identifies a question that must be answered or information that must be gathered to determine how strong the stimulus argument is. The information will be related to an assumption that the author is making. Another type of question that you will encounter asks you to *identify a flaw* in the stimulus argument. The question tells you that there is a problem with the logic of the argument. You just have to choose the answer that describes the flaw. Here are some examples of the ways in which these questions are worded:

- How does the author make his point?
- A major flaw in the argument above is that it...
- A's response has which of the following relationships to B's argument?

❑ Shortcut Approach

How to approach Reasoning Questions

- Read the argument and find the conclusion.
- State the reasoning in your own words.
- Check whether the reasoning given in the various options fall in line with the reasoning described above.

EXAMPLE 7. Stimulus Argument

Some observers have taken the position that the recently elected judge is biased against men in divorce cases that involve child custody. But the statistics reveal that in 40% of such cases, the recently elected judge awards custody to the fathers. Most other judges award custody to fathers in only 20%–30%of their cases. This record demonstrates that the recently elected judge has not discriminated against men in cases of child custody.

Question : The argument above is flawed in that it ignores the possibility that

Options :

(a) A large number of the recently elected judge's cases involve child custody disputes.

(b) The recently elected judge is prejudiced against men in divorce cases that do not involve child custody issues.

(c) The majority of the child custody cases that have reached the recently elected judge's court have been appealed from a lower court.

(d) The evidence shows that men should have won custody in more than 40% of the recently elected judge's cases involving divorcing fathers.

(e) None of these

Sol.

(d) The correct answer (d), points out a flaw in the argument. Specifically, it points out that the author of the argument was comparing the recently elected judge to other judges, not to the evidence presented in the recently elected judge's cases. In other words, the author of the argument made an unwarranted assumption that the recently elected judge did not rule against many men in custody battles where the evidence clearly favored the men. As with strengthening and weakening questions, the correct answer in flaw questions often involves unwarranted assumptions.

EXAMPLE 8. Stimulus Argument

Although dentures produced through a new computer-aided design process will cost more than twice as much as ordinary dentures, they should still be cost effective. Not only will fitting time and X-ray expense be reduced, but the new dentures should fit better, diminishing the need for frequent refitting visits to the dentist's office.

Question : Which of the following must be studied in order to evaluate the argument presented above?

Options :

(a) The amount of time a patient spends in the fitting process versus the amount of money spent on X-rays

(b) The amount by which the cost of producing dentures has declined with the introduction of the new technique for producing them

(c) The degree to which the use of the new dentures is likely to reduce the need for refitting visits when compared to the use of ordinary dentures

(d) The amount by which the new dentures will drop in cost as the production procedures become standardized and applicable on a larger scale

(e) None of these

Sol.

(c) The correct answer (c), highlights an assumption in the stimulus argument. It shows that the author must be assuming that the reduction in refitting with the new dentures compared to ordinary dentures is significant in order to conclude that that difference will help offset an initial outlay that is twice as much. In other words, if you answer the question posed by answer choice (c) with "not much," the argument is weakened. If you answer it with "a tremendous amount," the argument is strengthened. The other answer choices are all irrelevant because no matter what the answers are, there is no impact on the relationship between the evidence presented in the stimulus argument and its conclusion.

8. Identify a Parallel Argument / Structure.

The last type of Critical Reasoning question is the *parallel structure* question. In this type of question, you must choose the answer that has the same structure as the stimulus argument. In other words, you have to find the argument that is analogous to the given argument in that it includes the same relationship between the evidence presented and the conclusion. Here are some examples of the ways in which these questions are worded:

- Which of the following is most like the argument above in its logical structure?
- Which of the following is a parallel argument to the above given argument?

EXAMPLE 9. Stimulus Argument

It is true that it is against international law to provide aid to certain countries that are building nuclear programs. But, if Russian companies do not provide aid, companies in other countries will.

Question : Which of the following is most like the argument above in its logical structure?

Options :

(a) It is true that it is against United States policy to negotiate with kidnappers. But if the United States wants to prevent loss of life, it must negotiate in some cases.

(b) It is true that it is illegal to sell diamonds that originate in certain countries. But there is a long tradition in Russia of stockpiling diamonds.

(c) It is true that it is illegal for an attorney to participate in a transaction in which there is an apparent conflict of interest. But, if the facts are examined carefully, it will clearly be seen that there is no actual conflict of interest in the defendant's case.

(d) It is true that it is against the law to steal cars. But someone else certainly would have stolen that car if the defendant had not done so first.

(e) None of these

Sol.

(d) The correct answer (d), has the same structure as the stimulus argument. If you just replace "aid to developing nuclear powers" with "car theft," and "Russian companies" with the "defendant," it is essentially the same argument. Sometimes the parallel structure is easier to see if you use symbols to represent the terms of the argument: It is true that X is illegal. But, if Y doesn't do it, others will. Here X is stealing cars and Y is the defendant.

❑ Shortcut Approach

How to crack Parallel Argument Question?

- Read the argument and find the conclusion.
- Try to establish a reasoning structure between the premise and the condusion.
- Read out the options and look out for one having the similar reasoning structure.

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Practice Exercises with Hints & Solutions	–	P-199-208
Chapter Test	–	C-59- 60
Past Solved Papers		